



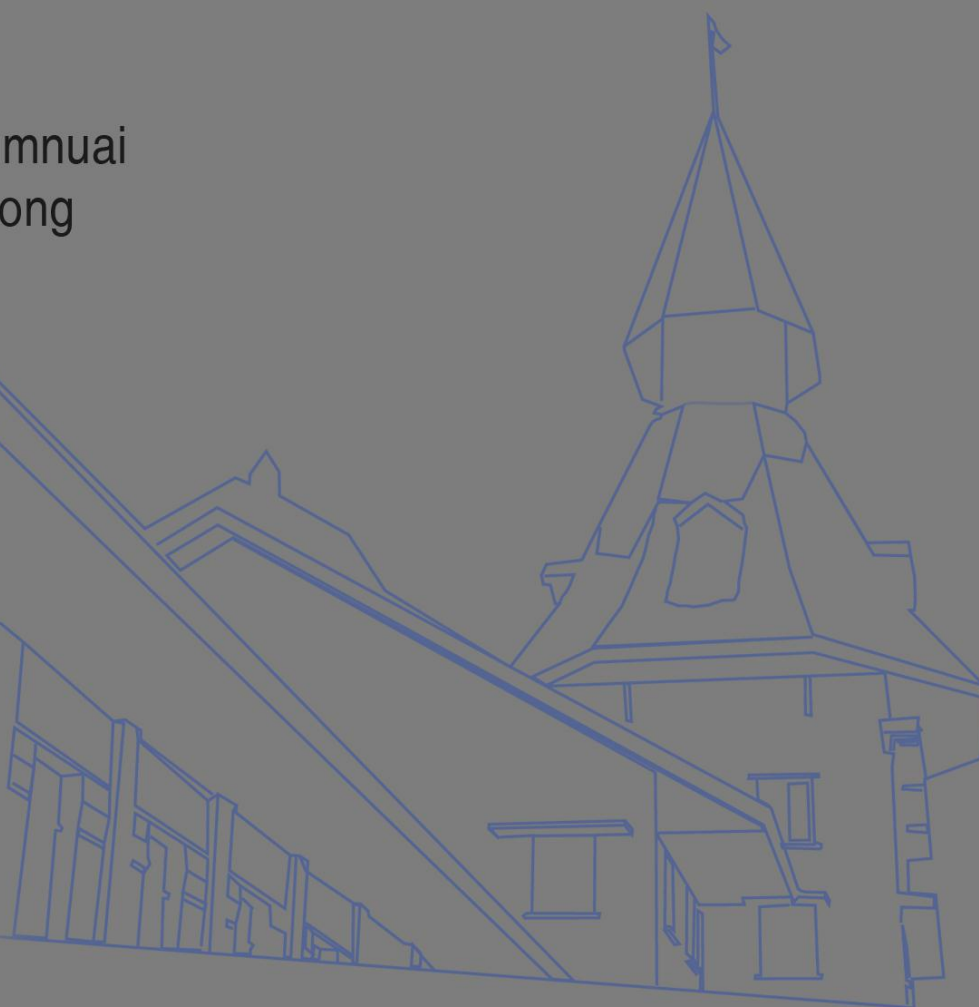
2011 Proceedings

The Eleventh International Conference on Electronic Business
Borderless E-Business for the Next Decade

November 29 - December 2, 2011
Pullman Bangkok King Power
Bangkok, Thailand

Edited by
Siriluck Rotchanakitumnuai
Laddawan Kaewkitipong

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“Borderless e-business for the next decade”

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The Pullman Bangkok King Power
Bangkok, Thailand

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Message from Conference Chair

Welcome to ICEB 2011, as you look at the conference program you'll see keywords:

Borderless

Next generation

Service Fairness

Service Innovation

Global E-readiness

Sustainable Business

Good Governance

Responsiveness

In the conference we begin with the metaphor of a Road Map, hopefully with GPS directions. There is no life in the present without connectivity. The eco-system we live in is becoming more electronic, more mobile, more beneficial in terms of responsiveness and sustainability. It can also be more frightening.

Innovation is at the speed of light. Our ability to use it is at the speed of our digits (thumbs for Blackberry, forefinger for IPADs)

Even with rapid innovation, one of the main factors that still holds things back is the failure to understand the full value and benefits of electronic or mobile capabilities, in business and much more broadly than just private business. Electronic business technology actually has huge potential to serve customers and citizens better worldwide. For instance, it offers opportunity to improve the performance of business and government service; it also offers assistance in solving social and community problems such as illness, drug abuse or reducing corruption.

At the same time it provides a portal to a very wide range of personal services, from entertainment fun such as music, games, gambling, to things like on-line personal investing.

It also is the window to more effective learning.

Our hope for this conference is that we can help to create greater understanding of the potential of e-business and its technologies, and develop better awareness of how to maximize potential and minimize its negative consequences.

Finally, I would like to thank all the authors as well as all the committee members and reviewers for their support, enthusiasm, and time, which help to make ICEB2011 become a successful conference during the critical time of flooding in Thailand.

Please enjoy, stay mobile and in touch.

Siriluck Rotchanakitumnui
ICEB-2011Conference Chair

Designing Next-Generation E-Health Technologies: Research Challenges and Opportunities

Keynote Presentation at ICEB 2012
Bangkok, Thailand

Abstract

As the baby boomer generation retires, and the world's population ages, we are witnessing a world in which many people are suffering from chronic diseases such as obesity, diabetes, COPD, congestive heart failure, stress and others. At the same time, we are going through a remarkable period of ICT development in which advanced new information and communication technologies such as sensors, body-wearable devices, monitors, smart phones and social networking apps are increasingly finding its way into patient's and consumer's lives. These new E-health technologies are poised to create a paradigm shift in healthcare delivery. They are changing the dynamics between patients and care-givers. E-health technologies leverage the power and ubiquity of mobile technologies to assist individuals and their clinicians in monitoring and managing symptoms, side effects and treatment for chronic illnesses outside the clinical setting, and to address the lifestyle factors that can bring on or exacerbate these conditions. These technologies can provide health care at a person's home, workplace or even when the person is mobile. There are numerous challenges and various stake holder issues that must be solved before such ubiquitous healthcare is possible. Dr. Chatterjee's lab has been at the forefront of designing several new E-health tools, prototypes and technologies such as in-home monitoring, context-aware mobile solutions, social media and crowd-sourcing participatory health systems that are currently in field trial. He will also discuss the policy and business model challenges facing the worldwide growth of E-Health. In particular he will present how persuasive and empowerment technologies can be built to achieve sustainable behavior change for patients and consumers towards leading a healthy lifestyle.

Samir Chatterjee, Ph.D., is a technology designer and healthcare IT strategist. He is a Professor in the School of Information Systems & Technology and Founding Director of the Network Convergence Laboratory at Claremont Graduate University, California. He holds a PhD in computer science from University of Central Florida. His research interests are in Telecommunications, IT Security, Healthcare Informatics and Telemedicine. Today he is at the forefront of the emerging field of persuasive technology, devices and applications that can alter human behavior. His current projects include mobile texting for diabetes, using sensor network in the home to detect activity of daily living and mine for disease patterns and he is developing a novel game for stress elimination meant for PTSD patients. He was program chair of [Persuasive 2009](#) international conference. He has published over 100 articles in refereed conferences and scholarly journals. He is the co-founder of the DESRIST series of design science conference in IS and a co-author of a book titled "*Design Research in Information Systems: Theory and Practice*" published by Springer in 2010. He has managed over \$2.4 million of research funding and his projects have been funded by National Science Foundation, The California Endowment and numerous other federal and private sources. In 2000-2001 he became active in VoIP area and helped the SIP standardization process including the formation of ITU-T standard known as H.350 which is standard in today's Cisco and Polycom VC systems. He was Vice Chair of EntNet Technical Committee for IEEE Communications Society and served on the TPC for Persuasive 2010, WITS 2011, ICIS 2011, IEEE Healthcom, and numerous other conferences. He is an Associate Editor of MIS Quarterly, Health Systems and IJBDN journals. He is a member of AMIA Academic Charter forum, AHIMA education strategy council and a senior member of IEEE and ACM. He has been an entrepreneur and successfully co-founded a startup company VoiceCore Technologies Inc in 2000. In his spare time, he is an avid musician who loves to play the guitar, keyboards and compose songs.

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MANAGING DWINDLING ONLINE MUSIC SALES : ANALYZING FACTORS AFFECTING GLOBAL MUSIC PIRACY

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Abstract

Piracy adversely impacts online music sales. This paper aims to investigate the factors that affect global music piracy directly and e-business indirectly. The factors can be clubbed into four categories, (i) economic, (ii) technological, (iii) legal/regulatory, (iv) behavioral/cultural. On analyzing the data of 55 countries, Intellectual Property Protection, trade freedom, income inequality and individualism/collectivism index of a country emerge as the most significant factors affecting music piracy. Hence, a nation can reduce its music piracy rate and enhance e-business by devising stricter laws to safeguard intellectual property, allowing more free trade with other countries and bridging the income inequality within a country.

Keywords: Music piracy; Individualism-collectivism, Intellectual property protection; online music sales; Trade freedom; broadband.

1. INTRODUCTION

Online music stores like iTunes, Amazon, HMV, Best Buy offer consumers legitimate alternatives to music piracy at affordable competitive prices. Yet the online music industry continues to suffer losses due to piracy. The global music sales fell by 30% between 2004 and 2010 primarily due to music piracy. [23]. Every year approximately 71,060 U.S. jobs and \$2.7 billion workers' earnings are lost due to music piracy. The national exchequer suffers a loss of \$422 million in tax revenues, \$291 million in personal income tax and \$131 million in lost corporate income and production taxes. Global music piracy causes \$12.5 billion of overall economic losses every year [15]. 'Music piracy' is committed by individuals who illegally upload or download music online, criminals who mass manufacture

counterfeit CDs for sale on street corners or retail stores or online companies who thrive on music theft by encouraging users to break laws. This takes a toll on the sales and talent of the entire music community [22] [28]. The profit margins of firms engaging in online music sales dwindle due to music piracy for the following reasons, (i) peer-to-peer(P2P) sharing using programs like BitTorrent and Kazaa, (ii) illegal websites which allow users to download music for free or at a very nominal charge, (iii) Local Area Network(LAN) based sharing in university campuses or in business organizations, (iv) smart mobile phones like iPhones and Androids, and (v) burning CDs [14].

In this paper, we focus on music piracy particularly because (i) Music files have a small size facilitating piracy (ii) the quality of pirated music files is comparable to that of the original music file. (iii) Digitalized music files, in the format of MP3, have the distinctive characteristics of digital goods like, (a) The first copy of digital goods requires a high-fixed cost to produce. The subsequent copies are almost inexpensive to reproduce and distribute, (b) Sharing music with others does not reduce the consumption utility of the product [5] [9]. These features of music files have facilitated their illegal distribution worldwide.

With the development of Information and Communication Technology(ICT) primarily through broadband technology, e-business activities of countries have flourished. Broadband has transformed businesses by enabling companies to engage in e-business and thus helping them to become more productive and innovative[36, 37]. On the other hand, broadband internet penetration within countries also facilitates piracy [38]. However, increase in the level of internet piracy threatens e-business [35].

This paper aims to determine if broadband penetration and easy access to high speed internet is the primary factor that affects music piracy trend across countries. We also explore what other forces, (i.e., legal, technical, behavioral and economic

factors) influence global music piracy directly and e-business indirectly.

This paper has 7 sections. Section 2 is a survey on the previous studies in the area of music piracy. Section 3, introduces our model. It also elucidates in detail the factors chosen in our model. In Section 4, we discuss the source of the data. Section 5 details the methodology used in this study. In Section 6 we show the data analysis and results. Discussion and Concluding remarks are found in Section 7.

2. LITERATURE REVIEW

Several studies have been conducted regarding factors that affect music piracy and e-business.

Bhattacharjee, Gopal and Sanders(2003) found that online behavior(purchase/pirate) towards music depends on Demographics(age, gender), Economic factors(value, income, price/distribution strategy) and Technology(connection speed, quality perception). In developing countries the growth in easy access to the internet has contributed significantly to increased piracy rates. In developed countries, it had no significant impact [3].

Bhattacharjee et al, 2005 noted that certain music industry specific factors impact music piracy. These include (i) debut rank of an album, (ii) reputation of the artist, (iii) major or minor label promoting and distributing the album, (iv) artist descriptors (solo female/solo male/group) and (v) holiday month debut on album performance [11].

Ki, Chang and Khang(2006) found that income level, income inequality, and market size directly impact music piracy, whereas education level, music CD price, and market size influence music piracy indirectly through intellectual property protection.[24].

Papadopoulos(2003) suggested a significant positive relationship between sound recording piracy market share and price-earnings(PE) ratio. He also predicted a directly proportional relationship between level of corruption and black market activity and music piracy. [25]

Bagchi, Kirs and Cervený(2006) studied the causes of global software piracy and identified four broad categories of factors(economic, technical, regulatory, and social/cultural). Nations with low corruption and weak collectivism had low piracy over a long period of time. Factors such as strong economic growth, high uncertainty avoidance, low Internet usage, better Information and Communication Technology(ICT) laws and strong IT infrastructure also caused low piracy in countries, within the time frame of the study. Another important aspect suggested by this study was that not just economic factors but a

combination of non-economic and economic factors that best explain piracy.[2].

From the above literature the factors that affect countrywise digital music piracy can be broadly be grouped into the following categories namely, (i) economic, (ii) technological, (iii) legal/regulatory, (iii) behavioural/cultural. Our focus in this paper is to emphasize factors that affect music piracy at a national level. Hence we ignore factors like demographics(age, gender) which affect online behavior at an individual level.

3. PROPOSED FRAMEWORK

Figure 1 shows our framework of the factors affecting global music piracy, like (i) economic, (ii) technological, (iii) behavioural/cultural and (iv)regulatory. If piracy reaches epidemic proportions, it threatens and often hampers e-business. Hence such factors directly influence music piracy but also indirectly influence e-business of a nation.

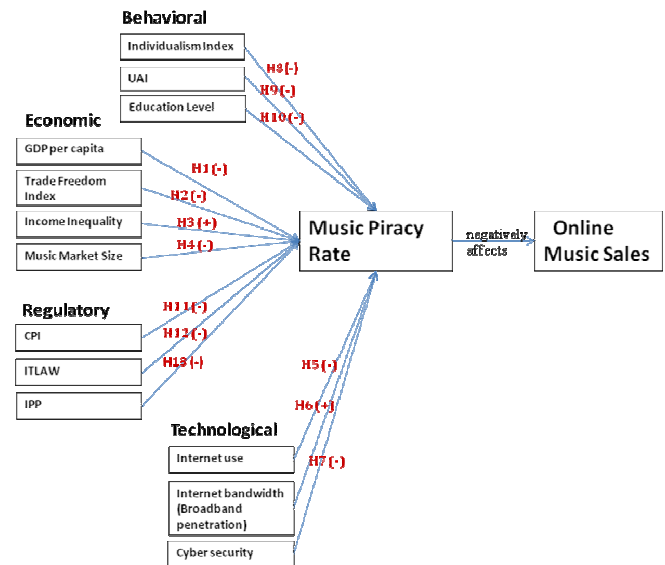


Figure 1. Framework of the Factors affecting Global Music Piracy and Online Music Sales

Music piracy rate = f (economic factors, technological factors, behavioral factors, regulatory factors)

3.1 Economic Factors

From the literature studied it has been found that the economic factors are among the most influential variables affecting music piracy.

3.1.1 GDP per capita: GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products[34]. GDP per capita is inversely related to software piracy level [17]. The higher the level of economic development of a nation, the lower is the music piracy rate[24]. Therefore the following hypothesis is formed

H1: Low GDP countries tend to indulge in piracy more.

3.1.2 Trade Freedom: This measures the degree to which a country allows traders to act and transact without intervention from government. Interventions include subsidies, taxes and tariffs, non-tariff barriers and even inter-government managed trade agreements[2]. Countries which are more open to trade and exports need to safeguard their competitive advantages in the international arena, hence they respect intellectual property rights of other nations. Thus, piracy rates are negatively related to a country's level of export and trade [26]. Based on this we can hypothesize that

H2: A country that is high on TFI will have lower piracy rates.

3.1.3. Income Inequality: In developing countries where income inequality is highly pronounced the higher income groups consume music more than the lower income groups. Lower income groups have a higher tendency to pirate music. Gini Index is used to measure income inequality as it measures the unequal distribution of income among consumers. Accordingly, the following hypothesis is drawn

H3: The higher the level of income inequality, the greater the rate of music piracy.

3.1.4. Market Size of the Music Industry: There is a significant relationship between a country's domestic software market and level of software piracy[7] [8]. Large markets which are attractive locations for foreign direct investments(FDI) have better intellectual property protection as FDI are not attracted to markets having weak intellectual property

protection[10] [26]. Moreover, in countries with a large music market, music is usually considered to be of large social value and hence copyright protection is strongly enforced to protect against music piracy[24]. Therefore, it can be hypothesized that

H4: The bigger the music market size, the lower the music piracy rate.

3.2 Technological Factors

The technological factors that affect music piracy are:

3.2.1 Internet Use: This is determined by the number of Internet Service Providers (ISPs) per capita [19]. More access to the internet means easy availability of software and music, piracy might actually decline [27]. Based on this, we form the following hypothesis

H5: Countries with easy access to Internet have lower rates of piracy.

3.2.2 Internet Bandwidth: Internet bandwidth is measured in megabytes per second (MB/s) per 10,000 population. It refers to the transmission speed or the throughput of the connection to the internet. The inclination to pirate music increases manifold as the internet bandwidth increases enabling easier download [3]. Therefore, the following hypothesis is drawn

H6: Countries with higher internet bandwidth have higher music piracy rates.

3.2.3 Cyber security: Lack of enforcement of cyber security measures increases the likelihood of piracy and intellectual property violations [43]. Moreover, piracy and cyber security threats go hand in hand. The use of illegal software or music often provides an entry point for computer malware and viruses. Hence proper enforcement of cyber measures help in reducing piracy [42]. Hence, the following hypothesis is formed

H7: Countries with greater cyber security enforcement measures have lower music piracy rates.

3.3. Behavioural/Cultural factors

At a national level different cultural factors actually determine what attitude people of the nation will be having towards intellectual property right and piracy.

3.3.1 Individualism/Collectivism Index: Hofstede's Individualism/Collectivism Index distinguishes between an individualistic society, where individual freedom and benefits are emphasized over societal benefits and a collectivist society, where individuals tend to form groups and take care of each other. Hence sharing of software or music among the members of the piracy club is desirable in such nations. Countries low on the Individualism index, tend to pirate more [13]. Hence, we hypothesize that

H8: Countries high on individualism index tend to pirate music less.

3.3.2 Uncertainty Avoidance Index (UAI): Hofstede's UAI focuses on the level of tolerance for uncertainty and ambiguity within the society [13]. A high Uncertainty Avoiding society is a rule-oriented society that institutes laws, regulations, and controls in order to reduce the amount of uncertainty that might be caused due to piracy [2]. People in such societies would be more comfortable in obtaining software and music by legal means. Therefore, the following hypothesis is formed

H9: Countries high on UAI tend to indulge in lower music piracy.

3.3.3. Education level: Education level plays an important role in music piracy because more educated people develop ethical and moral values due to which they view piracy as an unethical behavior. Thus, countries with better educated population have better enforcement of intellectual property rights and stricter ethical standards against music piracy [24]. Accordingly, the following hypothesis can be formed

H10: The higher the education level of the nation, the lower the music piracy rates.

3.4 Regulatory Factors

Legal and regulatory factors are essential in determining piracy as they determine access to and usage of digital content and also specify the rights granted to the consumers when they access digital content[29].

3.4.1 Corruption Perceptions Index (CPI): Transparency International has generated a Corruption Perceptions Index (CPI), which reports perceptions of corruption (as seen by business people, risk analysts, and the general public) within a

range between 10 (highly uncorrupt) and 0 (highly corrupt)[18]. It is believed that CPI is negatively related to piracy as countries high on CPI (highly uncorrupt) tend to pirate less [2]. Therefore, it can be hypothesized that

H11: Countries high on CPI tend to pirate music less

3.4.2 Laws related to Information and Communication Technology (ITLAW): This index examines the quality of the national legal framework with particular regard to ICT development and the extent to which intellectual property is protected. [19]. It is assumed that nations that are high on this index tend to pirate less as the copyright protection of information and communication content is stringent. Accordingly, the following hypothesis is formed

H12: Countries with stringent information and communication technology laws (ITLAW) have lower music piracy rates.

3.4.3. Intellectual Property Protection(IPP): Laws protecting Intellectual Property Rights(IPR) could be an effective measure in discouraging piracy[10] [24]. Hence we hypothesize that

H13: The stricter a country's intellectual property rights protection enforcement, the lower is the level of music piracy.

4. DATA

Table 1 lists the variables, their definitions along with their sources.

Table 1. Variables, Descriptions and Data Sources

Variable	Definition/ Measured	Data Source
Music Piracy Rate(PIR)	Through Measured as a percentage of total (legitimate and pirate) unit sales	Institute for Policy Innovation (IPI) report [14]
E-Business Readiness(RBR)	e-Business Readiness Index	Economist Intelligent Unit site[40]
GDP	GDP per capita	World Bank [20]
UAI	Uncertainty avoidance Index	Hofstede's index [13]

IND	Individualism/collectivism	
CPI	Index Corruption Perception	Transparency International
ITLAW	Index Laws relating to Information and Communication technology(ICT)	[18] Global Information Technology Report, 2004-05 [33]
TFI	Trade Freedom Index	Heritage Foundation [12]
Internet Bandwidth(BAND)	International Internet bandwidth (MB/s) per 10,000	Global Information Technology Report, 2008-09/Nationmaster site [19] [21]
Internet Usage(ISP)	Number of Internet Service Providers per billion of population(ISP per capita)	Nationmaster site [21]
Cyber security initiative(CS)	Number of secure internet servers per million of population	Global Information Technology Report, 2008-09 [19]
Education level(EDU)	Education Index	United Nations Development Program(UNDP) Report, 2005 [32]
Intellectual Property Protection(IPP)	Property Rights Index	Economic Freedom of the World, Annual Report 2007 [30]
Income Inequality(GINI)	GINI Index	World Bank [31]
Music Market Size(SIZE)		The music industry in the 21st century: Facing the digital challenge [34]

For some countries we did face the problem of missing values for certain factors. We have tried to gather the most complete dataset. We finally selected 55 countries based on availability of data for all the factors for the year 2007.

5. METHODOLOGY

We grouped the 55 countries into broader zones according to their geographical locations. Then we

compared their music piracy rates and also the factors that affected them. Next we found out the correlation amongst the dependent and independent variables. We then performed Multiple Regression Analysis on our data set in order to test the suggested thirteen hypotheses. The regression model is:

$$\text{Music Piracy Rate} = \alpha + \beta_1 \text{GDP} + \beta_2 \text{TFI} + \beta_3 \text{GINI} + \beta_4 \text{SIZE} + \beta_5 \text{ISP} + \beta_6 \text{BA} + \beta_7 \text{IND} + \beta_8 \text{UAI} + \beta_9 \text{EDU} + \beta_{10} \text{CPI} + \beta_{11} \text{ITLAW} + \beta_{12} \text{IPP} + \beta_{13} \text{CS} \dots \text{Eq (1)}$$

Finally we classify the 55 countries into 5 classes based on the level of music piracy exhibited by them.

6. DATA ANALYSIS AND RESULTS

6.1. Descriptive Statistics

A relation between e-business readiness rank and music piracy rate of countries was observed. Figure 2 shows a graph plotted of the music piracy rate against the e-business readiness of each country. The data labels represent the number of countries plotted at each point.

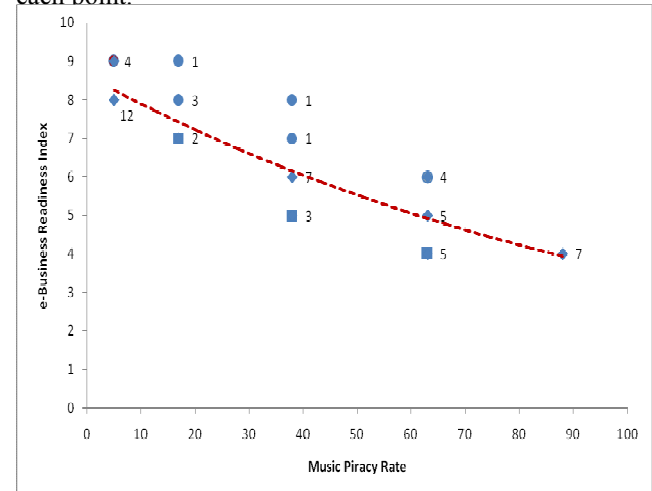


Figure 2. Graph of the music piracy rate against the e-business readiness of each country

The graph trend shows clearly that high e-business readiness ranked countries have low rate of music piracy and vice versa. Enforcement of Intellectual IPR and reduction in piracy promote the local IT industry of a country. e-business is associated with the IT sector of a country. Countries with strong IT sector engage in more e-business activities. 33 countries out of the 55 in the sample fall on the trend line.

These 55 countries were grouped into broader regions as per their geographical locations. A region-wise comparison of the music piracy rates and the factors affecting them was conducted.

There was great variation among the regions in all aspects. Some of the findings are shown in Figures 3a, 3b and 3c. These figures are obtained by plotting the means of the variables affecting global music piracy across seven zones formed by geographical proximity. It is observed that Australia, Europe and North America have higher than average e-Business readiness while Asia, Central and Latin America, Africa and Eastern Europe have lower than average e-Business readiness. At the same time, Africa, Central and Latin America, Asia and Russia and East European regions have higher than average music piracy rates whereas Australia, North America and Europe have lower than average music piracy rates. It is observed that continents with higher than average e-business readiness have lower than average music piracy rates.

EDU, IPP, TFI, GDP, CPI, IND, ISP, CS, ITLAW, BAND and SIZE are lower for Africa, Asia, Central and Latin America and Russia and Eastern Europe compared to North America, Europe and Australia. This seems to support hypotheses H10, H13, H2, H1, H11, H8, H5, H7, H12, H4. Hypothesis H6 is not supported from the data. Central and Latin America, Africa and Russia have higher GINI index compared to North America, Australia and Europe. This supports hypothesis H3.

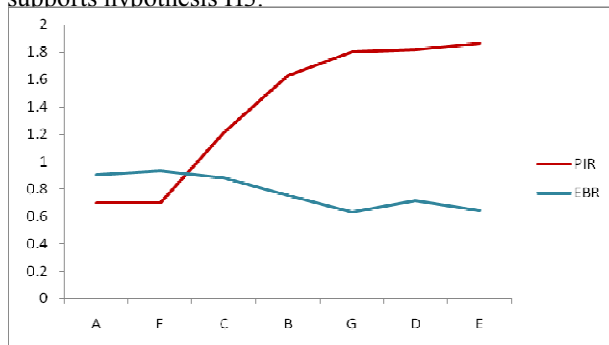


Figure 3a. Region-wise mean of PIR and EBR

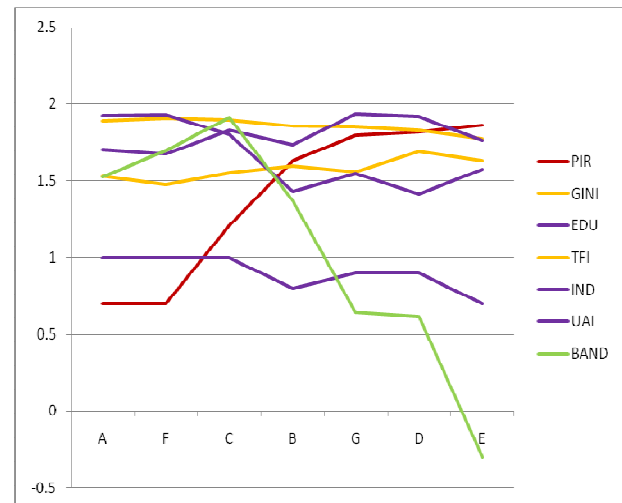


Figure 3b. Region-wise mean of some factors affecting PIR

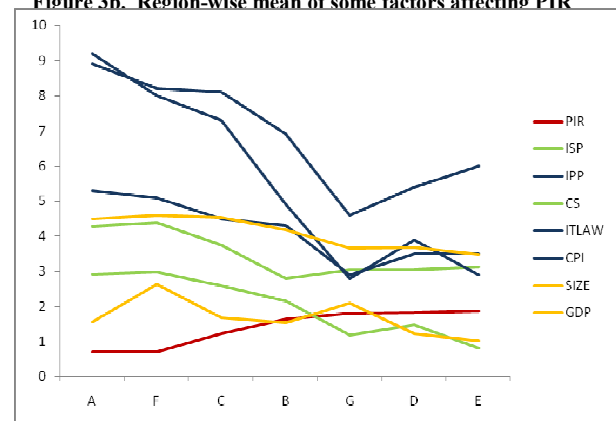
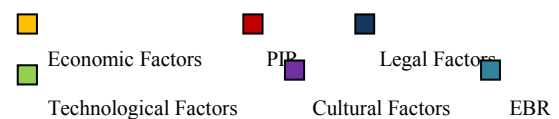


Figure 3c. Region-wise mean of some other factors affecting PIR



Geographical Zones:

A = Australia; B = Asia; C = Europe; D = Central and Latin America; E = Africa; F = North America; G = Russia and Eastern Europe

6.2. Correlation Analysis

We conduct a correlation analysis between PIR and EBR of countries. Table 2 shows that the two variables have very high significant (1% level) negative correlation (.916). Hence, PIR and EBR are inversely proportional. We ignore EBR in further

analyses as the results can be easily inferred due to strong negative correlation with PIR. We also conduct correlation analysis of all the independent variables and the dependant variable (PIR). As shown in Table 3 all the independent variables except UAI and SIZE have significant association with the dependant variable, PIR. Hence we exclude these two factors from further analysis. Moreover, all the variables have the same signs as predicted by the hypotheses except BAND which contrasts H6 that higher the internet bandwidth available i.e. higher the ease of downloading music, higher is music piracy rate. It also shows that CS, CPI, IPP, GDP, IND, TPI have a higher correlation with music piracy rate compared to the other factors.

Table 2. Correlation matrix between PIR and EBR

	PIR	EBR
PIR	1	-.916(**)
EBR	-.916(**)	1

** p < 0.01

Table 3. Correlation matrix between the dependent and independent variables.

	A	B	C	D	E	F	G	H	I	J	K	L	N
A	1												
B	-.425 **	1.44 **	1										
D	-.38 **	.59 **	-.36 **	1									
E	-.59 **	.53 **	-.11 **	.31 *	1								
F	-.83 **	.68 **	-.29 **	.30 *	.40 **	1							
G	-.71 **	.5 **	-.24 **	.27 *	.65 **	.59 **	1						
H	-.79 **	.74 **	-.35 **	.35 **	.43 **	.79 **	.56 **	1					
I	-.87 **	.8 **	-.36 **	.38 **	.59 **	.87 **	.70 **	.81 **	1				
J	-.69 **	.71 **	-.47 **	.58 **	.53 **	.57 **	.39 **	.53 **	.64 **	1			
K	.26 **	-.45 **	.08 **	-.19 **	.10 **	-.38 **	-.09 **	-.56 **	-.36 **	-.24 **	1		
L	-.82 **	.8 **	-.45 **	.36 **	.56 **	.75 **	.64 **	.69 **	.86 **	.70 **	-.31 *	1	
M	-.56 **	.63 **	-.26 **	.28 **	.38 **	.56 **	.41 **	.51 **	.65 **	.49 **	-.46 **	.66 **	1
N	-.26 **	.39 **	-.25 **	.31 **	.22 **	.13 **	.12 **	.26 **	.17 **	.36 **	-.04 **	.25 **	.02

* p < 0.05, ** p < 0.01

A = PIR; B = CS; C = GINI; D = ISP; E = EDU; F = IPP; G = TFI; H = ITLAW; I = CPI; J = IND; K =UAI; L = GDP; M = BAND; N = SIZE

6.3. Regression Analysis

Table 4 shows the results of ordinary least square regression analysis on the dataset. The first four models show the results of the regression analysis on the data by eliminating the highly insignificant variables at each stage. The last model shows the results of stepwise regression on the dataset. Model 1 includes all the variables except SIZE and UAI because as per the correlation analysis, they do not have significant correlation with the dependant variable, PIR. Model 2 is obtained by simplifying model 1 by eliminating the least significant variables (highest p-value and lowest t-statistic); ISP, CS and BAND. Model 3 is obtained by simplifying model 2 by eliminating the next two least significant variables; CPI and GDP. CPI also had a VIF score of 9.48, hence its best to remove this variable from the model. Model 4 is obtained by simplifying model 3 by eliminating the next least significant variable; ITLAW.

The coefficient of determination R^2 explains the amount of variation in the dependant variable explained by the regression model. Model 4 explained 84.3% variance in the PIR and Model 3 explained 85%. The F- ratio represents the improvement in results from fitting the model relative to the inaccuracy that still exists in the model. All the models have high F-ratios which are significant($p < .001$). Model 3 and Model 4 have F-ratios of 45.29 and 52.46. Finally the Durbin Watson statistic for models were close to 2. This satisfies the assumption of regression analysis that the errors are uncorrelated.

The stepwise regression analysis generated four models of which only the final model has been reported in the last column of Table 4 as it has the highest R^2 value(.838) of all the four models generated. It has a high F-value of 64.56 and a Durbin Watson score close to 2.

Table 4. The models with β coefficients(t-statistics in brackets)

	Model 1	Model 2	Model 3	Model 4	Stepwise
CS	-.108 (.49)				
GINI	.11 (1.49)	.10 (1.50)	.12* (1.78)	.14** (2.06)	
ISP	.03 (.47)				
EDU	-.109 (-1.19)	-.11 (-1.25)	-.14 (-1.59)	-.15* (-1.74)	
IPP	-.323** (-2.46)	-.332** (-2.59)	-.42*** (-4.02)	-.52*** (-6.41)	-.32*** (-2.04)
TFI	-.17* (-1.82)	-.17* (-1.85)	-.20** (-2.32)	-.21** (-2.41)	-.24*** (-2.96)
ITLAW	-.12 (-1.14)	-.12 (-1.14)	-.15 (-1.53)		
CPI	-.14 (-.76)	-.11 (-.66)			-.29** (-2.97)
IND	-.14 (-1.39)	-.12 (-1.32)	-.15* (-1.81)	-.15* (-1.8)	-.22*** (-2.72)
GDP	-.09 (-.66)	-.09 (-.70)			
BAND	.033 (.424)				
R ²	.86	.85	.85	.84	.84
Adjusted R ²	.82	.83	.83	.83	.82
F-test	26.31	34.01	45.29	52.46	64.56
Durbin Watson	1.72	1.69	1.74	1.58	1.64

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Considering all the statistics we select Model 3, Model 4 and the stepwise regression model for further analysis. Hypothesis Testing is conducted based on the regression results of these models. All the three models show that IPP is the most significant variable (at 1% level) and has a moderately high negative correlation with PIR. Thus, we can confirm H13. TFI is highly significant (1% level) in the stepwise regression analysis and moderately significant (5% level) in Models 3 and 4 of the Linear Regression Analysis. TFI has a negative correlation with PIR. Hence, hypothesis H2 is confirmed. IND is highly significant (1% level) in the stepwise regression analysis and weakly significant (10% level) in Models 3 and 4 of the Linear Regression Analysis. Hence, we can conclude that it is an important variable in predicting piracy. IND has a negative correlation with PIR, this supports H8. GINI Index has a moderate significance (at 5% level) in Model 4 and a weak significance (at 10% level) in Model 3. It is positively correlated with PIR. Hence hypothesis H3 is confirmed. CPI is found to be moderately significant (at 5% level) in the stepwise regression. It is negatively correlated PIR. However as seen in Table 5, it has significant high correlation with IPP(.872) and ITLAW(.813) and the VIF score for CPI is also very high. Hence, we cannot

conclusively prove the relationship between CPI and PIR. Therefore, H11 cannot be conclusively proved. EDU is found to be weakly significant(at 10% level) in Model 4. Hence no conclusive evidence was found for the correlation between EDU and PIR. Thus H10 cannot be conclusively proved. The other hypotheses i.e. H1, H4, H5, H6, H7, H11, H12 are rejected by the regression analysis. Let us provide some probable explanations for the rejections. Though GDP played an important role in determining the music piracy rate earlier, its impact has been declining over the years and other regulatory and social factors have gained more importance. This is why GDP (H1) did not emerge as a significant factor affecting music piracy. Technological factors (H5, H6 and H7) also emerge insignificant due to similar reasons. CPI (H11) and ITLAW (H12) are important regulatory and deterrent factors for any criminal activities. However, in the context of music piracy, intellectual property protection and punishment for IPR violations assume greater importance.

Table 5. Supported Hypotheses to determine the factors which affect music piracy

Variable	Hypothesis	Relation with piracy	β coefficient (Model 4)	t-statistic (Model 4)	Level of support
GDP	H1	(-)			Not supported
TFI	H2	(-)	-.21	-2.41	Supported
GINI	H3	(+)	.14	2.06	Supported
SIZE	H4	(-)			Not supported
ISP	H5	(-)			Not supported
BAND	H6	(+)			Not supported
CS	H7	(-)			Not supported
IND	H8	(-)	-.15	-1.81	Supported
UAI	H9	(-)			Not supported
EDU	H10	(-)	-.15	-1.74	Moderately supported
CPI	H11	(-)			Not supported
ITLA W	H12	(-)			Not supported
IPP	H13	(-)	-.52	-6.41	Supported

(-) inverse relation, (+) positive relation

6.4. Classification

Based on the data the music piracy rates of the countries broadly fall into five levels: 5, 17, 38, 63 and 88. Table 6 classifies the countries into 5 classes based on their music piracy rates.

Table 6: Classification of countries based on music piracy rate

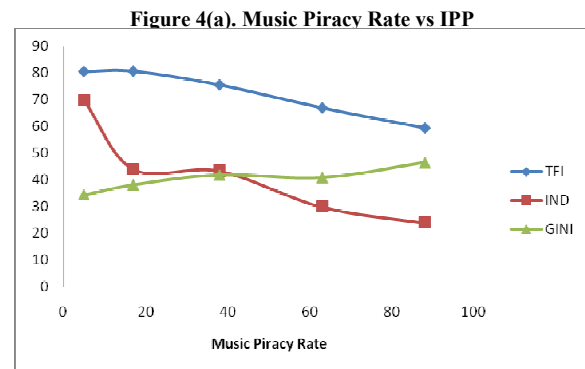
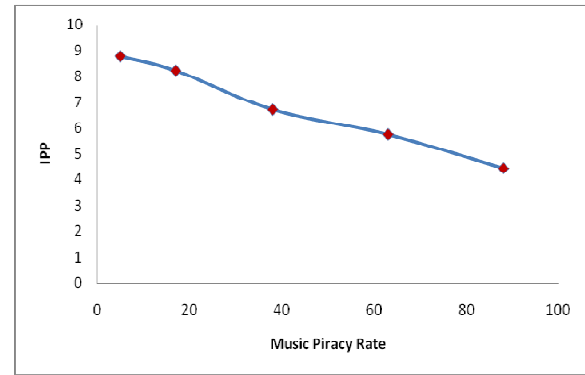
VLow(5)	Low(17)	Mid(38)	High (63)	VHigh (88)
Australia	Finland	Brazil	Argentina	China
Austria	Hong Kong	Czech Republic	Chile	Indonesia
Belgium	Netherlands	Greece	Colombia	Kenya
Canada	Portugal	Hungary	Costa Rica	Libya
Denmark	South Korea	Italy	Egypt	Nigeria
France	Spain	Malaysia	India	Venezuela
Germany		Philippines	Kuwait	Paraguay
Ireland		Poland	Mexico	
Japan		South Africa	Pakistan	
New Zealand		Taiwan	Panama	
Norway		Thailand	Russia	
Singapore		UAE	Turkey	
Sweden			Uruguay	
Switzerland			Ukraine	
United Kingdom				
United States				

Table 7 represents the number of countries in each class. It also shows the mean value of each of the significant parameters arrived from the correlation and regression analysis.

Table 7. Class Means of the significant variables

Piracy Class	Frequency	IPP	TFI	IND	GINI
Very Low	16	8.78	80.62	69.68	34.46
Low	6	8.23	80.73	44.00	38.23
Medium	12	6.72	75.63	43.33	41.9
High	14	5.75	67.02	29.85	40.92
Very High	7	4.44	59.54	23.85	46.5

In Figure 4, we plot the piracy classes on the x-axis. On the y-axis we plot class means of the 4 significant variables, namely (i) IPP, (ii) TFI, (iii) IND and (iv) GINI Index, obtained from Table 7.

**Figure 4(b). Music Piracy Rate vs TFI, IND and GINI**

The figures 4(a) and 4(b) show that music piracy rates increase with decrease in intellectual property protection, trade freedom and individualism index and increases with increase in income inequality (GINI Index).

7. DISCUSSION AND CONCLUSION

Music piracy is a serious menace that most countries encounter globally. With the increase in broadband penetration music piracy has also increased. So have e-business and e-commerce. However, piracy has a negative effect on e-business. This study is aimed to gain a better understanding of the various factors that affect global music piracy rates directly and e-business indirectly. The factors were grouped into four broad categories: (i) economic (GDP per capita, trade freedom, income inequality and music market size), (ii) technological (usage, internet bandwidth and cyber security implementation), (iii) behavioural (Individualism/collectivism index and Uncertainty Avoidance Index) and (iv) regulatory (Corruption Perception Index, laws related to ICT and intellectual property protection).

Intellectual Property Protection emerges as the most significant variable that affects music piracy rate negatively. Countries which have more stringent protection of intellectual property, including copyrights, patents, trademarks etc. have lower music piracy rates. Trade freedom is also found to have significant negative impact on the music piracy rate of a country. This is because countries which engage in more trade with other countries are concerned about their image and fear the repercussions if caught in acts of piracy and copyright violations. Countries that offer little protection of copyrights are therefore not attractive destinations for business activities [10]. The individualism-collectivism index of a country also has significant negative impact on the music piracy rate. Countries high on the individualism index have a population that would not be willing to participate in activities like music piracy and sharing through the formation of piracy clubs. They would prefer to have a copy of the music for themselves. Furthermore, the GINI index which shows the level of income inequality that exists in a country also has a significant positive impact on the music piracy rate. Education level of the population of a country also emerges as a weakly significant factor affecting music piracy rate.

Thus we can conclude that economic, regulatory and behavioral factors play an important role in predicting music piracy rate across countries. Technological factors like the available bandwidth, security measures employed and internet usage do not emerge as significant variables in determining music piracy rate. This shows that socio-economic and regulatory factors or a combination of them bypass the influence of technological factors. Hence increase in broadband penetration alone does not increase piracy. Broadband penetration and bandwidth is higher in regions like North America, Australia etc. Such regions are also highly individualistic in nature and have high intellectual property protection enforcement which act as deterrent controls to prevent piracy. The technological factors may also appear insignificant because the sample size of 55 countries is not large enough or because most of the countries in the sample belong to the middle to low income group where internet penetration was not very high in 2007.

The behavioral factor, individualism/collectivism of a nation is inherent within the population it is not easy to change it in a go. However, in order to control music piracy rate and enhance e-business, the legal and economic factors can be controlled. A nation can go a long way in reducing its music piracy rate by

devising stricter laws to safeguard intellectual property and by punishing intellectual property violations more severely. Also, by allowing more free trade with other countries and bridging the income inequality within a country the music piracy rate can be reduced. Increasing the level of education and awareness among the population can also aid in reducing music piracy. Also implementing effective educational and regulatory campaigns to educate users about copyright laws and inspiring attitudinal changes about inappropriate copying behaviour can help curb music piracy.

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ENHANCING DECISION PATTERNS DISCOVERED BY PROCESS MINING WITH SEMANTIC RELATED DATA

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ABSTRACT

Business processes can be automatic, semi-automatic or manual processes. Semi-automatic and manual processes are involved in some parts by people. Understanding how people work or make judgments in processes can help management to evaluate their performance and suggest essential information to enhance their decision making. This paper describes a case study of using process mining to discover decision patterns of a worker in a semi-automatic business process. It was found that the discovered rules could be improved by enhancing the business execution log file with semantic related data. The experimental results before and after improvements were compared.

Keywords: Process Mining, Decision pattern, Decision making, Semantic related attribute, Log enhancing

INTRODUCTION

Business process mining is a recent technology used in Business Process Analysis, which aims at monitoring, diagnosing, simulating and mining enacted processes in order to support analysis and enhancement of process model [4]. It starts by gathering process data logged by the IT systems of a company, such as Enterprise Resource Planning (ERP), Supply Chain Management (SCM) and Customer Relationship Management (CRM) [5]. Through mining and analyzing these data, we can extract knowledge about the actual process execution, uncover patterns in process data as well as predict potential problems in current processes. ProM, a project by the Process Mining Group, Eindhoven Technical University-Netherlands, is an open source and extensible framework that supports a wide variety of process mining techniques and analysis tools in the form of plug-ins. Researchers have applied ProM to analyze many areas of business, such as process discovery (automatically construct a process model from the event logs), conformance checking (compare the recorded behaviour with some already existing process model to detect possible deviations) or extension (e.g. how the value of data attributes may affect the routing of a case) [2].

Analysis of various perspectives is also possible in ProM depending on the data recorded in log files. The basic attributes of each process required for mining include a process instance ID, activity

name, event type, originator or performer and timestamp. These attributes allow ProM to mine in *control-flow* and *organizational* perspectives. The *control flow* mining displays the abstraction of process model as a flow of activities where a decision point (if any) indicates an alternative flow and the route taken is determined at run time (FIGURE 1 shows an example). The *organizational* perspective discovers social networks of people handing over tasks or an organizational hierarchy of people involved in a process. For other perspectives, such as *performance* and *quality*, additional attributes need to be recorded in a log file.

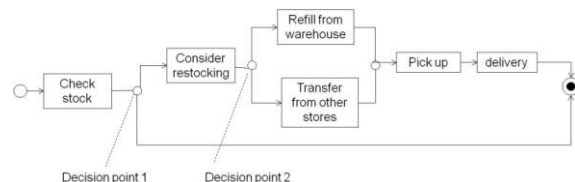


FIGURE 1 : Abstract Representation of Business Process.

The perspective of our interest is decision pattern of activities' performers. Along a process flow, performers can be people, the system or both depending on whether the process is manual, automatic, or semi-automatic. In a manual process, the process model can represent the way people work or decide on something, especially when the human decision involves routing the direction of activities. By mining the manual or human part of a semi-automatic process, we can discover not only the process model, but also the human decision model along the process flow. At each decision point accomplished by a human, we can analyze the attributes that influence the human decision. The analysis results may reveal "business rules" or "individual rules" that humans use in process execution, which can be used for guiding decision process improvement and human performance evaluation.

The main contribution of this work is to find the decision patterns of real case process which is semi-automatic. It compared decision rules derived from system and human and argued that data in the event log is not enough for discovering decision rules especially human decision. Humans are able to use not only explicit, but also implicit knowledge in their judgement. This work suggested the way to improve the results of discovery by enhancing the log file with semantic related data.

In this paper, a semi-automatic business process in a retail warehouse was studied. The process execution data in the past was extracted from the database and transformed into a log file. This file was mined and analyzed by ProM with the purpose of decision rules discovery. The remainder of the paper is organized as follows. Section 2 reviews related research in business process mining and work that makes use of business process mining technology. Section 3 introduces the background of this case study, and the details of the studied process and tested data. Section 4 shows the results from process mining. Section 5 discusses the analysis of results and enhancement. Section 6 talks about future work and section 7 presents the conclusion.

RELATED WORK

The application of process mining in the context of workflow management was first introduced in [10]. In 2005, the ProM framework for mining business processes [2] was developed, and has since been applied to many application domains to discover processes and analyze decision making, from multiple perspectives.

An early example of the practical application of business process mining is found in [13], where process mining was used to analyze the processing of handling invoices for the Dutch National Public Work Department. In this paper, three perspectives of process mining (i.e., control-flow, organizational and case perspectives) were analyzed and the results were combined to reach a richer understanding of the process. The work of [9] presented a process mining approach in the gas industry, converting the process model discovered by ProM into a Petri Net that was editable and redesigned by CPN Tools. In the Health Care domain [8] presented an evaluation and comparison of process models derived from real life clinical data using seven different process mining algorithms. Process mining has also been used as a tool to detect exceptions in a process, such as in the case of fraud. This was studied in [7] using ProM's HeuristicsMiner to detect flaws in the procurement process of a company.

The input to process mining is often extracted from information systems in the form of log files. When sufficient data to define process instances is not available in the log files of enterprise systems, cases together with related events and data are often extracted from the relevant tables in databases to create process instances. In the case of [11], the log files to support three perspectives of analysis were derived from queries over a hospital information system, and then mined to discover an understandable process model.

For the analysis of decision patterns, [1] introduced an approach to analyze how data attributes influence the choices made in a process. This approach identifies decision points in a Petri

Net process model discovered by an algorithm in ProM to turn a decision point into a learning problem. The authors in [1] developed the Decision Miner plug-in to the ProM framework and tested it with the liability claim process in an insurance company.

Our work is similar to the work mentioned above, but slightly extends its purpose by applying the process mining and decision point analysis to the semi-automatic process called restocking process. This studied process involves tasks accomplished by both human and machine. The rules discovered by Decision Miner are not only business rules coding in program logics, but also decision rules of human where their judgments are really important to the success of business process. Like the most other real cases and the work of [11], the input data is not perfect. Cases related info is derived from associating tables in relational database where data from applications used by human are recorded. Our work enhances the result of Decision Miner and increases the possibility to discover rules by adding semantic related data to log file. It shows that transactional data found in most log files are not sufficient for decision analysis especially human decision.

CASE STUDY

The case study of this paper is a company that sells clothes for ladies and gentlemen, which we will refer to as the "Acme Company". Acme owns several major brands of women ready-made dresses and leatherwear, and distributes products to department stores, as well as its own retail stores. Distributing and transferring products to/from these stores are critically key process of the company. Usually, new products are launched every two weeks and these products are distributed to each store in only a small amount, two pieces per stock keeping unit (SKU) for the beginning. SKU identifies product type, size and color. The undistributed products are stored in the central warehouse, and are sent daily to stores that have sold products (the "refill process") to maintain inventory level. When the stock of new products in the central warehouse becomes empty, products are redistributed among retail stores and department stores as needed, which is called the "transfer process". This process is controlled and decided by "merchandisers", the person or group of persons who are responsible for promoting their individual brands. The success of this process strongly depends on the decision making of merchandisers as the results directly affect the sale amount of products being transferred. Deciding to move products to the right places at the right time may increase the opportunity of sales and generate more revenue to the company. From now on, we refer to both refill and transfer processes as a restocking process.

Details of the Studied Process

Even though the restocking process involves many units in the company such as commercial, logistics and points of sale, we focused only on the decision parts in the commercial department where merchandisers are the key actors. The restocking process is semi-automatic, using the Restocking Information System (RIS) in the commercial department, but paper-based system in others. All activities are done in sequence and on a daily basis. Starting from the commercial department, RIS detects out-of-stock Point of Sales (POS) where products are sold out. It begins refill process automatically to restock products if available from central warehouses to those POS. POS that are not refilled because the stock of central warehouse is empty will be moved on transfer process. In this process, RIS generates two main reports called NoStk report (out of stock report) and StkAvail report (stock available report). Grouped by SKU, the NoStk report lists all stores or POS, where products are sold out and not refilled. The StkAvail report, on the other hand, lists all POS that have products available in stock. For each SKU, merchandisers have to decide to move products logically from stores in the StkAvail report, where stock is available, to stores in the NoStk report, where stock is not available, via the interface of the system (FIGURE 2).

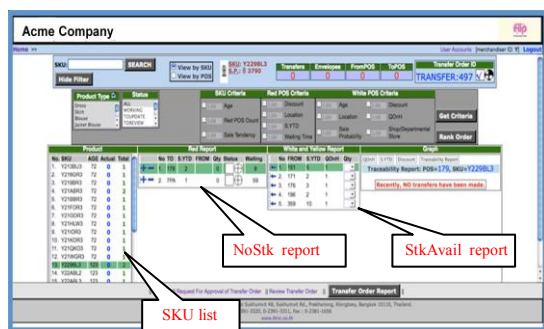


FIGURE 2: Restocking Information System's Interface Used by Merchandisers for Making Transfer Decision.

Typically, in each SKU, a merchandiser selects a POS from the NoStk report and then selects the quantity to transfer from one or more POS from the StkAvail report. Before completing each POS-POS transfer, the merchandiser has an option to see additional information in pop up windows or in paper-based reports to support his/her decision. The examples of additional information for each POS include sales performance, size of POS, current percent discount and waiting days for restocking etc. A merchandiser usually finishes the logical transfer of products among stores in the morning and all selections made from RIS including refill are recorded in the database. Related documents (e.g. transfer notes, moving notes) are generated and printed. The results of selection are then passed to brand managers who

are responsible for approving the refill and transfer lists for their own brands. After approval, those printed documents are signed and passed to the logistics department, who physically relocate products among POS based on the approved results. The complete circle of a refill (warehouse to POS) and transfer case (POS to POS) takes at least 2 days beginning from logical transfer decision by merchandisers and ending with physical transfer by logistics.

Details of Data

The data used for this study is historic data in May 2009. Since this company owns many major brands, each of which has many new and aging products restocked in that period, we only considered refill and transfer cases for products launching from 2007-01-01 of a brand in order to analyze the decision pattern of one merchandiser. Within this period, there were about 11544 instances waiting for restocking while only about 207 cases or 1.8% was accomplished. The company had recently replaced a paper-based system with a new restocking information system (RIS).

The company does not keep data in event log form, but rather in relational database. In order to analyze decision patterns in process, a log file was generated from this data source. The stock data is recorded in SKU unit, which identifies the product type, color and size. We defined stock of a SKU in a POS as a process instance in order to see its changes while passing along the process flow. The steps done in RIS lists activities the system and merchandiser did when making logical refill or POS-POS transfer and were used to complete process instances. To get completed data for a transfer case, a document named transfer note recorded as a table, generated automatically after completing logical refill or transfer, is used to link data from all related tables. This document table records date of restocking, SKU, from-POS and to-POS. In case of refill, from-POS will be either 777 or 7BP which are identifications of central warehouses. These data were extracted and organized in the form of a log file containing the date of logical transfer, person who made transfer, activities, and the data related attributes. Apart from physical product movement by logistics, timestamp data were recorded in date as all activities done by merchandiser were completed in a day for just several clicks from the RIS.

PROCESS MINING WITH CASE STUDY

As shown in FIGURE 3, there are three main steps using ProM to mine and analyze this process. The first step is data preparation. The historic data from the relational database was loaded, arranged in the form of an event log and was transformed into MXML (Mining XML).

MXML [2] is a format required by ProM, using a framework called ProMImport [3], which is able to load various types of log file from several type of information systems and convert from original format to MXML [13]. The second step is process mining, where the MXML file is mined with the desired perspective (process discovery in this case) to create a process model. The third and final step is analysis, where the resulting model is analyzed.

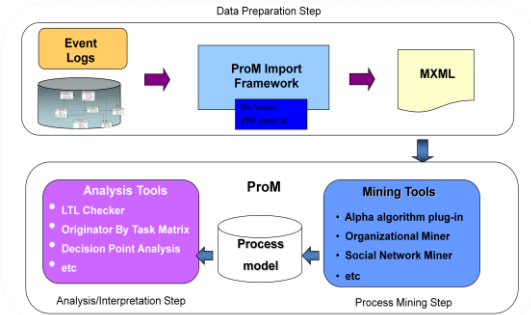


FIGURE 3: Process Mining Steps with ProM.

Data Preparation Step

TABLE 1: The Extract of Data in Log in Table Format.

Instance#	Task/Activity	Actor	EventType	Timestamp	Data
1	Notify Stock Empty	RIS	Complete	06/05/09	POS=187, prd_code=2006040288395
1	Check from warehouses	RIS	Complete	06/05/09	WH status = NOT EMPTY
1	Refill from warehouses	RIS	Complete	06/05/09	
1	Refill old products	RIS	Complete	06/05/09	from-POS=777, quantity = 1
1	Create Moving Notes	RIS	Complete	06/05/09	bill_no = 7651
1	Approve transfer & refill list	Mrs Praiya	Complete	06/05/09	status = OK
2	Notify Stock Empty	RIS	Complete	06/05/09	POS=117, prd_code=2006040332321
2	Check from warehouses	RIS	Complete	06/05/09	WH status = NOT EMPTY
2	Refill from warehouses	RIS	Complete	06/05/09	
2	Refill new products	RIS	Complete	06/05/09	from-POS=787, quantity = 2
2	Create Moving Notes	RIS	Complete	06/05/09	bill_no = 7652
2	Approve transfer & refill list	Mrs Praiya	Complete	06/05/09	status = OK
3	Notify Stock Empty	RIS	Complete	06/05/09	POS=142, prd_code=200604032116
3	Check from warehouses	RIS	Complete	06/05/09	WH status = EMPTY
3	Make transfer decision	Ms. Hatairat	Complete	06/05/09	SKU= G33ABL4 to-POS = 142
3	Confirm transfer	Ms. Hatairat	Complete	06/05/09	from-POS=185, quantity = 1
3	Create moving Notes	RIS	Complete	06/05/09	bill_no = 7501
3	Approve transfer & refill list	Mrs Praiya	Complete	06/05/09	status = OK
4	Stock Empty Notification	RIS	Complete	06/05/09	POS=116, prd_code=200604032109
4	Check from distribution WH	RIS	Complete	06/05/09	WH status = EMPTY
4	Make transfer decision	Ms. Hatairat	Complete	06/05/09	SKU= G33ABL3 to-POS=116
4	Suspend transfer	RIS	Complete	06/05/09	
4	Create moving Notes	RIS	Complete	06/05/09	
4	Approve transfer & refill list	Mrs Praiya	Complete	06/05/09	status = OK

As previously mentioned, the restocking information system itself does not record event in form of log file, but the system records data as transactional tables in MySQL database. Although ProMImport can convert files from many types of information system, it has no plug-in to work directly with MySQL, but MSAccess. We therefore used MSAccess as a mediation format. We linked transactional data about this process in form of four MSAccess tables which were instance, instance data, activity, and activity data tables and used the available plug-in in ProMImport to convert them into an MXML file containing process instances describing process instance id, activity/task name, event type (start, suspend, resume, complete etc), originator (person who initiates task), timestamp and other data attributes. The extract of four process instances represented in one table format is shown in TABLE 1.

Process Mining Step

At this step, the MXML log file was loaded into ProM. As mention earlier, ProM provides various plug-in algorithms for the purposes of mining. In our case, we used the Alpha algorithm plug-in [14], to derive a process model in Petri Net, a format required by Decision Miner later used in the analysis section) showing the real execution of this merchandiser using RIS. Based on the data in the log file, a process model with 10 activities was discovered. These activities are:

1. Notify stock empty
2. Check from warehouses
3. Make transfer decision
4. Refill from warehouses
5. Suspend transfer
6. Confirm transfer
7. Refill old products
8. Refill new products
9. Create moving notes
10. Approve transfer and refill lists

The abstract model of the derived process is shown in FIGURE 4 Focused only on activities in the commercial department using RIS, we considered activities 1 and 10 as starting and ending activities. Activities 1, 2, 4, 7, 8, 9 were done by the system while activities 3, 5, and 6 were performed by a merchandiser and activity 10 by a brand manager.

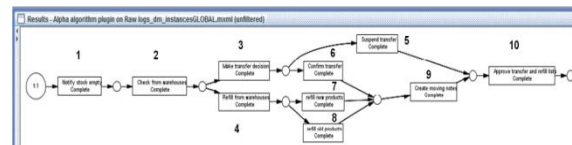


FIGURE 4: A Process Model Discovered by Alpha Algorithm.

Process Analysis Step

The derived model showed several alternative paths (FIGURE 5) where the decision involve routing the direction of activities. Decision point A and B are done by RIS to determine whether a stock should be refilled or transferred and the refill moves products from old product warehouse or new product warehouse respectively. Decision point C is done by merchandiser to determine whether a stock should be restocked from a transfer process. We would like to analyze the factors that influenced the decision points to discover decision rules and check whether all decisions rules follow business rules. Especially merchandiser's decision in transfer process because the results of transferring are directly affects sales opportunity. ProM supports this kind of analysis with Decision Miner, a decision point analysis plug-in. This algorithm determines all decision points (if any) in the discovered model to find which properties of a case might lead to taking a certain route/path in the process model.

Using the decision tree algorithm C4.5 provided by the Weka library, Decision Miner converts decision points into classification problems where the classes are the different decisions that can be made in a process [1].

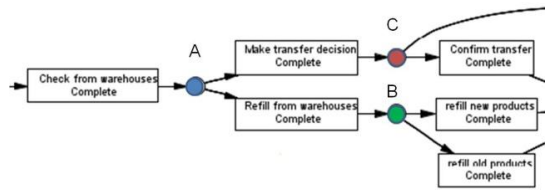


FIGURE 5: All Decision Points Discovered by Decision Miner.

The following summarizes the results from the Decision Miner at each decision point where data attributes in log file were considered.

Decision point A shows the system decision on selecting refill or transfer

Statistics	
Correctly Classified Instances	99.9827%
Kappa statistic	0.9374
Mean absolute error	0.0003
Root mean squared error	0.0132
Relative absolute error	11.4449%
Root relative squared error	34.3219%

Rule discovered

WH status = EMPTY: Transfer
WH status = NOT EMPTY: Refill

FIGURE 6: Decision Point A - Result from Decision Miner.

The decision point A was done by the system with two alternatives: “Refill from warehouses” and “Make transfer decision. With almost 100% correctly classified instances, it was revealed that the status of warehouses for requested products (*WH status*) is the attribute that routes the case. If the warehouse of selected SKU is not empty, the system refills products to *to-POS*, otherwise forward it to transfer process. This discovered factor is straightforward as the decision point A is decided by the system which works according to business rules encoded in the programs.

Decision point B shows the system decision on selecting type of refill.

The result of decision point B, which is the step of selecting warehouse to move product from, is shown in FIGURE 7. For Acme Company, the stock of new products, launched in latest season, are stored in warehouse 7BP, while the stock of dated products, and were moved and stored in warehouse 777. This decision point, therefore, determines the warehouse (*from-POS*). It is

discovered that requested POS for products having code > 2006040325088 will be refilled from warehouse 7BP; otherwise it will be refilled from warehouse 777.

Statistics

Correctly Classified Instances	88.2353 %
Incorrectly Classified Instances	11.7647 %
Kappa statistic	0.7463
Mean absolute error	0.1961
Root mean squared error	0.3131
Relative absolute error	40.3397 %
Root relative squared error	63.6096 %

Rule discovered

If *prd_code* <= 2006040325088 : refill old products
If *prd_code* > 2006040325088 : refill new products

FIGURE 7: Decision Point B - Result from Decision Miner.

Decision point C shows the merchandiser’s decision on selecting POS from the NoStk report. Some POS were selected to be restocked while others were not.

Statistics

Correctly Classified Instances	98.3517 %
Incorrectly Classified Instances	1.6483 %
Kappa statistic	0
Mean absolute error	0.0324
Root mean squared error	0.1273
Relative absolute error	99.7505%
Root relative squared error	100%

Rule discovered

suspend transfer decision

FIGURE 8: Decision Point C - Result from Decision Miner

The result of decision point C, which is the step of selecting POS from NoStk report to be restocked, is highlighted (FIGURE 8). The selected POS continued to the “Create moving notes” activity while the unselected POS were passed to “Approve transfer and refill lists” activity. Merchandiser, named “Ms Hatairai” of studied brand plays a key role in making decision. With the information recorded before decision point C in the log such as POS id (*to-POS*) and product code (*prd_id*) no rule was discovered.

ANALYSIS OF RESULT AND ENHANCEMENT

The decision point analysis works well to discover business rules, but not human rule from data in the log. As clear business rules are fixed and encoded in the program, which can direct the system performing tasks automatically in automatic process such as *refill* process in our case. The RIS system first checks the status of

warehouse to decide whether a stock should be refilled or transferred. It also checks from the barcode of products to determine whether products are latest or dated. However, in semi-auto process which deals with people, business rules sometimes cannot direct people in deciding, but instead as guideline. Each person may use his/her own personal judgement in doing something. Like our case, merchandisers are group of people who are experts in the fashion market of the company. They are familiar with their brands, market segments, fashion trends, target groups and target areas. So, they use their expertises and experiences in their work to fulfil the global objective of company which is increasing sales. As their individual decision in restocking products may affect the company in overall sales, the patterns of them usually interests the management to study.

It is noticed that data supplied to Decision Miner are limited to data found in event log. These logged data are input, output or updated data which are usually entered or updated by the programs or users. For example, in our TABLE 1, *POS* and *prd_code* are the beginning input to the RIS. *SKU*, *to-POS* (from NoStk report), *from-POS* (POS from StkAvail report) and *qty transferred* are directly selected from RIS main interface and recorded as activity's data of *Make transfer decision* and *Confirm transfer* activities. These recorded data are enough to discover business rules for process performing by machine, but not enough for human. Human decision is not quite straightforward as machine decision. Human can use not only explicit knowledge but also implicit knowledge about data for judgement. It is observed from the case study that merchandisers may use semantic related data about POS from the pop-up screen on the system interface or from the paper reports, or from their own heads (implicit knowledge) while selecting POS from NoStk report. The examples of these semantic related data about POS are area, size, sales performance and current discount etc (the description of these properties is listed in TABLE 2). These semantic related attributes were not found in the original log file (TABLE 1).

TABLE 2: Semantic Related Data of POS.

Properties	Description
area	the location of POS
size	the size of POS which is measured by the amount of products in pieces (no actual size recorded in database)
sales for SKU	the amount of sales (in pieces) for a given SKU since its launching date in the POS
overall sales	the overall amount of sales (in pieces) for any products in the POS
discount	the current %discount in POS
waiting	the number of waiting days for out of stock SKU (only for POS in OoS report)
type of POS	the owner of POS e.g. Acme, department stores etc

With the assumption that these related data should influence the decision of merchandisers in some way, we added these POS related attributes to the

log and rerun Decision Miner. The new results of decision point C (decided by merchandiser) asserted our assumption. The discovered rules is quite long, but the major factors influenced this point are uncovered. They are POS size, waiting days for restocking, current discount at POS and type of POS respectively.

size => if greater than 426, *confirm transfer*
else consider **waiting**

waiting => if greater than 2 weeks, *suspend transfer*
else consider **discount, sales for SKU**

discount => if greater than 0% then *confirm transfer*
else consider **sales for SKU, POS type**

POS type => if POS belongs to Acme then *confirm transfer* else *suspend transfer*

It was showed that merchandiser for this brand selected POS to be restocked from its size (larger stores tend to be located in target areas), waiting (POSs waits too long may be ignored as they are not prioritized or no products available in any stores), discount (products tend to be moved to POS having current discount promotion as they are likely to be sold) and POS type (POSs owned by Acme itself are given high priority).

Similar to POS, we added product semantic related data to see their effects to decision point 1 and 2 as product code is the major attribute for these two decision points. The added attributes and their descriptions can be found on TABLE 3.

TABLE 3: Semantic Related Data of Product

Properties	Description
SKU	stock keeping unit identified by product code
brand	brand of product
type of product	type of product e.g. shirt, skirt, blouse, pant etc.
season	the season that product was launched e.g. 2, 3, B etc
size	size of product e.g. 2, 3, 4, 5 etc.
color	color of product e.g. white, black, brown etc
birthdate	the launching date of this product

After rerun Decision Miner with additional data attributes about product, the discovered rule in decision point1 was not changed. However, rules of decision point2 was changed to

birthdate <= 1217782800000: refill old products
birthdate > 1217782800000 : refill new products

Remark : *birthdate* is changed to numeric format by the C4.5 algorithm

The attribute in the rule is changed from *prd_code* to *birthdate*. We found that *prd_code*, *birthdate* and season are correlated attributes. Without *prd_code* and *birthdate*, the rule is relied on *season* attribute.

season = 3: refill new products
season = B: refill old products
season = 2: refill old products

It was shown that products that have *prd_code* greater than 2006040325088 are products that have *birthdate* > 1217782800000 (numeric format of date) and are products in *season* 3 which is the latest season, so they are executed by *Refill new products* or refill from warehouse 7BP. Adding related data attributes of product to log did not make the algorithm to discover new more rules, but add semantics to the previous discovered rule. In case of decision point 2, it is more readable to analyst to determine product by its *season* or *birthdate* rather than its *prd_code*.

DISCUSSION AND FUTURE WORK

The experiment with the case study above demonstrates the enhancement of results from Decision miner. It was found that semantic related data which are part of domain knowledge should be deserved to be considered in data mining phase. In most data mining research, data miner needs some domain knowledge for data preparation where data set is filtered and organized [12]. This pre-processing step is required so that the results are likely to exhibit real patterns of interest. In our case, Decision Miner simply applies data mining algorithm to a process model discovering from process mining. It does not involve data preparation. Thus, semantic related attributes deriving from domain knowledge, could be added to the input log at the step before which is data preparation step.

However, specifying semantic related attributes in program codes is not suggested as the code cannot be reused with other data sets. It is time-consuming to modify program every time the data set changes. The algorithm to enhance a log file should only provide the mean to add attributes, but not to include the attributes to be added. The practical way to model these semantic related attributes is using ontology. Ontology provides method to model domain knowledge via concepts and relationships. In our case, we can model domain knowledge in form of apparel ontology including concepts like POS, SKU and their relationships. Semantic related attributes of SKU and POS which are part of domain knowledge can be derived from this ontology and they will become the input for enhancing log file. The design of domain ontology is on progress. Once successfully designed, domain ontology can be reused in many semantic analysis tools [4].

Although useful to improve the results of Decision Miner, including semantic related data can make the system overload if there are many attributes and many process instances. The enhanced log file becomes large and it may take much more time to finish process mining. To overcome this problem, we can filter irrelevant attributes and add only most relevant ones before decision mining step. Several algorithms are available in Weka [6] for selecting attributes.

These algorithms evaluate, rank or choose the most relevant attributes to supervised class for classification problem. They provide the means to filter out unrelated attributes from the analysis. Including attribute filtering feature is being implemented in our work.

Since data about restocking process are quite a lot, we selected only process data for one brand of products involving only one merchandiser. We also interest to see the decision patterns of other merchandises working for other brands and test how semantic related attributes affect their decision rules. The result of this investigation will be found in our future work.

CONCLUSION

This paper describes the use of process mining to analyze business processes with a real case study in the fashionable products industry. The case study focuses on the “restocking process”, where products are refilled or transferred among points of sale to optimize the opportunity for sale. This process is semi-automatic; some activities are done automatically by the systems and some are done by “merchandisers” who decide to move products from one location to another. Since the decisions of merchandisers strongly affect the opportunity to sell products, studying of their strategies is quite beneficial to the company. The experiments were conducted in 3 steps. Firstly, historic data related to the activities of this process were collected to create a log file. Secondly, this log file was mined with the Alpha algorithm plug-in to discover a process model that represents the real execution flow of the process. Thirdly, the discovered process model was analyzed with the Decision Point Analysis plug-in to locate all decision points that influence the paths of execution. At each decision point, the patterns of attributes and factors that influence the decision were uncovered and analyzed. The experiments showed that no rule was discovered in some decision points and some rules are not easy to understand. Our work proved that the data from the log file are not enough for decision point analysis especially human decision. We introduced the way to improve the analysis results by enhancing log file with semantic related data. It was showed that new rules and more meaningful rules could be disclosed.

Our current and future work will focus on designing domain ontology to derive semantic related attributes and looking for methods in selecting only related attributes to enhance the log file, so that mining algorithm will not be overloaded. The more data sets varying on actors and brands will also be tested.

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INTEGRATING SERVICE FAIRNESS INTO THE POST-ACCEPTANCE MODEL OF IS CONTINUANCE IN CLOUD COMPUTING

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ABSTRACT

This study integrates service fairness into a post-acceptance model of information system continuance. This study added constructs based on Greenberg's (1993) four-component taxonomy of organizational justice. The research model seeks to be useful in predicting satisfaction, which enhances continued usage of an IS. The results show that perceived usefulness and satisfaction influence continuance intention, as the post-acceptance model predicts. Three of the four distinct service fairness dimensions, systemic, configural and interpersonal fairness, significantly enhanced satisfaction. However, the relationship between informational fairness and satisfaction was negative and significant.

Keywords: Service fairness, Satisfaction, Post-acceptance model, IS use, Cloud computing

INTRODUCTION

Information technology (IT) service providers spend millions of dollars annually trying to retain current customers. Customer satisfaction in IT service support has a major impact on intentions to maintain contact with service providers who manage and provide a particular technology. There is a subtle distinction between continuing to use a service technology versus continuing to obtain the service from a particular service provider, and a similar distinction between satisfaction with a service technology versus satisfaction with the technology's service provider. This research focuses on satisfaction with service providers in a context where the service is provided through a technology.

While most prior information system (IS) research has attempted to explain user acceptance of new IT, recent research has focused on IS continuance or continued usage. The technology acceptance model (TAM) and expectation confirmation theory (ECT) are the dominant theoretical frameworks explaining user acceptance and continuance of IT [5][41]. In addition, a post-acceptance model (PAM) of IS continuance [5] has been widely adopted in the continuance intention literature.

Satisfaction is often a key issue in such research. This research proposes a theoretical integration with PAM by arguing that perceived usefulness and satisfaction are necessary for IS continuance intention. Satisfaction is contingent on customer perceptions of service fairness with a service organization provider who provides a technological product together with services.

Thus, fairness helps shape perceptions of satisfaction. In practice, IS service provider organizations in a competitive market seek to meet or exceed customer satisfaction levels, which helps keep customers using their systems. Customer

retention is critical to long-term profitability in services e.g.,[53]. Customer satisfaction is influenced by numerous variables. Among these are organizational fairness variables, which influence customer satisfaction by exerting influence upon individual satisfaction.

This research examines two interrelated research streams to integrate Greenberg's (1993) four-component taxonomy of organizational justice or fairness into PAM. In PAM, perceived usefulness and satisfaction directly influence intentions to continue using an IS. This research demonstrates the relationship of service fairness with satisfaction. The four distinct fairness constructs are systemic, configural, interpersonal, and informational. Enhancing satisfaction through service fairness would then improve IT continuance intention through the PAM relationships. Figure 1 presents the conceptual model and hypothesized relationships.

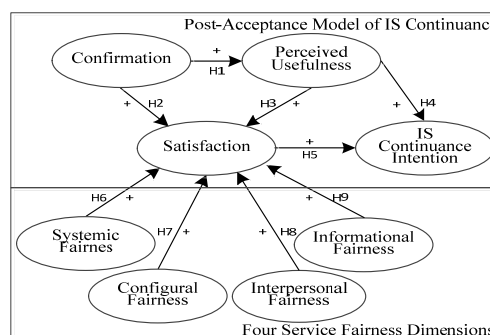


Figure 1 Conceptual model

The context of the study is Software-as-a-Service (SaaS) with the cloud computing environment as the IS application and SaaS users as the IS sample. Cloud computing is an emerging technology enhancing subscribers' perceptions of SaaS as a long term solution requiring long-term partners [52][55]. Cloud computing has already been widely adopted among both businesses and non-profit organizations. It is a good example of the wider SaaS market, which is rapidly growing as developers and service providers continue to make investments in developing the technologies.

LITERATURE REVIEW

The post-acceptance model (PAM) of IS continuance proposed by Bhattacharjee (2001b) seeks to explain user intentions to continue or discontinue using an IS. The upper part of Figure 1 illustrates key constructs and relationships of the PAM model. In it, perceived usefulness and satisfaction directly influence IS continuance intention. The model was developed based on ECT as used in research on consumer behavior [36]. Continuance behavior may be defined as explaining user intentions to continue (or discontinue) using an IS, where a continuance decision follows an initial acceptance decision.

The model assumes that a user's expectation toward using an IT system, after initial acceptance and use, should not be different from his/her expectations before using it, if pre-acceptance expectations are confirmed and the system meets prior expectations (perceived performance equals expectations). This confirmation will influence both satisfaction and perceived usefulness. Users form judgments about benefits from perceived usefulness, and so intention to continue using an IS will be influenced by both perceived usefulness and satisfaction. The model thus parsimoniously explains decisions to continue to use an IS.

In line with Bhattacharjee (2001b), this study assumes that confirmation of expectation and perceived usefulness from prior use are the main antecedents of post-acceptance user satisfaction. Confirmation is defined here as an individual user's perception of congruence between expectation prior to use and actual performance [5]. Perceived usefulness is the degree to which an individual user believes that a particular system delivers benefits, notably that it will enhance his or her job performance by reducing the time to complete a task, and facilitate completing the task with high quality [5].

Customers' initial expectations can be easily confirmed (or not) as soon as they have actual experience. Customers may have varying experiences in different systems, and adjust their perceptions to be consistent with their perceived reality. If use of the system generates worse results than expected, the disconfirmation will negatively alter their prior perceived usefulness, but good results will enhance perceived usefulness. Thus, confirmation positively influences perceived usefulness. Bhattacharjee (2001a, 2001b) showed that the level of user confirmation influences perceived usefulness in business-to-consumer e-commerce services [4]. These considerations lead to the hypothesis:

H₁: The extent to which a user's expectations are confirmed is positively associated with the level of perceived usefulness.

One of the definitions of satisfaction from Spreng, MacKenzie, & Olshavsky (1996) is "an affective state that is the emotional reaction to a product or a service experience" (p. 17). User satisfaction is therefore defined as the end-user's perception when interacting with a specific application [27]. Levels of customer satisfaction result from many factors, although these are all grounded in the customer's experiences with the service and the interaction with the service provider.

A number of studies empirically validate that confirmation and satisfaction are linked [5][35][37][38]. PAM explains this relationship by noting that confirmation implies a realization of the expected benefits of IS usage, while satisfaction assesses the user's positive or negative experience with the IS. Realization of benefits results in satisfaction. As customers continue using the system with good results, confirmation reinforces satisfaction. Therefore:

H₂: The extent to which a user's expectations are confirmed is positively associated with the level of satisfaction.

Perceived usefulness also influences satisfaction. To understand this, it should be remembered that perceived usefulness assesses the degree to which an IS gives access to increased performance, while satisfaction assesses the user's positive or negative experience of using the IS. According to PAM, perceived usefulness and satisfaction should be positively and significantly correlated, and previous research demonstrates that usefulness perceptions impact attitude during both pre-acceptance and post-acceptance stages of IS use. Bhattacharjee's (2001b) study showed that perceived usefulness influences the satisfaction of individual users.

In accordance with these observations, the more a user perceives the system to be useful, the more satisfied he or she will be with the system. Thus, the third hypothesis is:

H₃: The perceived usefulness of the IS is positively associated with a user's level of satisfaction with using the IS.

As noted above, TAM provides a limited explanation of continuance behaviors. By itself, or even with its extensions, TAM is somewhat weak in the ability to predict post-acceptance continued IT usage [16][33] or to explain discontinuance after successful acceptance [5]. Bhattacharjee (2001b) notes that "long-term viability of an IS and its eventual success depend on its continued use rather than [its] first-time use." (pp. 351-352). This is the basis for the distinction of PAM from TAM, with PAM's focus on IS continuance intention.

Perceived usefulness is one of the two main antecedents to intention to use in TAM, and it also directly influences subsequent IS continuance intentions in PAM. Based on TAM, perceived usefulness can significantly influence a user's decision to adopt an IS. Bhattacharjee's (2001b) study showed that perceived usefulness also influences a user's decision to continue to use an IS. Perceived usefulness will positively influence continuance intention and lead to his or her continuing to use the system. Therefore:

H₄: The perceived usefulness of the IS is positively associated with intention to continue using the system.

User satisfaction is a significant factor in the IS context [5][6][48]. Online, e-satisfaction is a key determinant of technology acceptance and continued usage [10][15]. PAM views relationship satisfaction as a basis for the continued intention to use IS; user satisfaction with prior use has a strong positive impact on intention to continue using the system. The more an individual user is satisfied with the prior usage experience, the higher the chance that he or she will continue to use the system [5]. Other IS researchers have also found that user satisfaction is a strong predictor of system use [2]. This relationship can be stated as:

H₅: Satisfaction with initial IS usage is positively associated with IS continuance intention.

PAM has been extended by various researchers, adding complexity to examine various antecedents to its constructs. Most of those issues are outside the scope of this research, which aims specifically to determine the impact of service fairness on satisfaction. We show that the basic PAM works in the cloud computing context; otherwise there would be little need to worry about satisfaction. However, the various extensions of PAM are not necessary for simply showing that PAM works, so the original simple PAM framework is used. Here, the basic PAM model is extended from satisfaction, which is a key construct influencing continuance intention (as in H_5). Thus, the discussion now turns to examining service fairness from the standpoint of organizational fairness and with respect to its influence on user satisfaction.

The Structure of Organizational Fairness

Organizational fairness is an important construct which has been widely discussed in the field of organizational behavior [3][13]. (Prior studies have used both 'justice' and 'fairness' interchangeably. Here, 'fairness' is used for consistency.) Organizational fairness has also received attention in the context of employee perceptions of fairness in the workplace with regard to matters such as job satisfaction, complaint handling, human resource management [17], customer satisfaction with services and service delivery [12][20].

Organizational fairness is defined as the perception of fairness by an individual in the working environment [9][18]. Service fairness is a customer's perception of fairness shown by a firm's service personnel [44], or, in an IS context, by a software service provider's personnel. Scholars have identified various dimensions. The first two-dimensional understanding of organizational fairness analyzed distribution fairness (the fairness of outcomes of a particular decision) and procedural fairness (the fairness of the process which leads to the outcomes) [9]. Bies and Moag (1986) proposed interactional fairness (the fairness of interpersonal treatment) as a third dimension. Interactional fairness split off from procedural fairness, and refers to the perceived fairness of interpersonal treatment.

Various typologies and configurations, analyzed in either two or three dimensions, have been proposed in discussions of organizational fairness [19]. Work in management and marketing has investigated the relationship between organizational fairness and satisfaction [39]. Fairness plays a significant role in service failure and recovery [23][30][46][54] and service management [12][44]. In service management, perceptions of fairness are important antecedents of customer satisfaction [22]. Clemmer (1993) found that service fairness leads to satisfaction, and another study of hospital patient satisfaction found that equity and expectation affected satisfaction and return intention [49].

Greenberg (1993) proposed a four-component taxonomy of organizational fairness designed to emphasize the differences between structural and social determinants of fairness. The distinction between these two determinants is based on the immediate focus of the just action. Each of the four components of this taxonomy is formed by the intersection of

the two categories of fairness (procedural and distributive) with the two focal determinants (social and structural). The four specific fairness categories which these give rise to are:

1. Systemic (structural-procedural) fairness is based primarily on Leventhal's (1980) procedural fairness model, which "refer(s) to the variety of procedural fairness that is accomplished via structural means" [19, p.83]. It explains the procedures for structurally determined fairness to provide participant control over outcome processes. Procedural fairness includes procedures and processes for making decisions [19][51].

In service delivery, systemic fairness refers to the policies and procedures utilized to handle the service delivery process. When customers perceive high systemic fairness, they will believe that an unfair outcome was merely an accident and will expect systemic fairness to occur the next time. That is, they will be less likely to terminate their relationship with the service provider and they remain satisfied with the service. Additionally, customer satisfaction will increase if the service provider provides advanced technology support to monitor and track their service, especially with on-line customers. Empirical results support the concept of perceived systemic fairness that has a direct impact on customer outcomes. Customer feelings of having experienced a fair process can be used to increase customer outcomes (i.e. satisfaction), and this consideration leads to the following hypothesis:

H₆: Perceptions of systemic service fairness will be positively associated with satisfaction.

2. Configural (structural-distributive) fairness explains the structural aspect of distributive fairness and "refer[s] to the variety of distributive justice that is accomplished via structural means" [19, p.84]. It is defined here as the extent to which resource distribution is perceived as being fair under various conditions [19]. Distributive fairness is closely related to the outcome of service delivery and is also related to the perceived fairness of restoring services to a consumer following a service failure, or the outcome of service failure events. Distributive fairness can be seen in the form of refunds, reimbursements, corrections to charges, replacements, repairs, and apologies [25].

In service delivery, customers feel that they have been treated equally (or not) with respect to the final service outcomes, judging that this comes partly from how the system is structured. Feelings of configural fairness can be important between the customers and the service provider, as individual customers feel they should receive the same services from the service personnel as anyone else. Customers can have negative feelings if they find that they receive fewer resources than others. Configural fairness is helpful in building a good relationship with customers and leads to satisfaction [19][44][50]. Thus, the following hypothesis is proposed:

H₇: Perceptions of configural service fairness will be positively associated with satisfaction.

3. Interpersonal (social-distributive) fairness is part of the interactional fairness which split from the original two dimensions of fairness [7][8], and here is involved in the social aspect of establishing distributive fairness [19]. Interpersonal fairness refers to the kind, polite and proper treatment that service providers give to their customers. It can be accomplished by “showing concern for individuals regarding the distributive outcomes they receive” [19, p.85] and concerns individual outcomes and a customer’s desire to be treated with courtesy, dignity, respect and politeness by others [13][19]. Thus, if service personnel are able to manage the quality of treatment in service delivery, the customer perceives a proactive effort based on honesty, respect and politeness, allowing negative feelings to be reduced and interpersonal fairness to increase [12][46].

The treatment an individual receives in off-line or face-to-face settings is more important than in on-line contexts, and can increase or decrease customer complaints depending on how service personnel treat customers [11]. Fair interaction (i.e. interpersonal fairness) leads to positive customer outcomes. When customers feel they have been treated fairly, with respect, sincerely and politely by the service provider personnel throughout the service delivery process, the level of customer satisfaction will increase. From this, the following hypothesis is developed:

H₈: Perceptions of interpersonal service fairness will be positively associated with satisfaction.

4. Informational (social-procedural) fairness involves the social aspect of establishing procedural fairness [19]. Conceptually, it is also part of interactional fairness [13][19]. Greenberg (1993) commented that “informational justice may be sought by providing knowledge about procedures that demonstrate a regard for people’s concerns” (p. 84). Perceptions of informational fairness are thus socially rather than structurally determined. Informational fairness is found in the form of logical explanations and justifications of the allocation processes.

Therefore, in IT service delivery, informational fairness can take the form of any information provided by service providers. Customers are given information about services they have received or with which they have been involved; customers need to be kept informed before and during changes to service processes. When they perceive a fair information exchange (i.e. informational fairness); this can be used to increase customer outcomes. High levels of informational fairness may be achieved by being truthful in all communications and tailoring service providers’ explanations to customer needs. Customers must feel they have been given satisfactory explanations before, during, and after the service delivery process. Thus:

H₉: Perceptions of informational service fairness will be positively associated with satisfaction.

These dimensions of service fairness should have an impact on satisfaction, and H₆ – H₉ address the question of whether

an individual’s perception of the various dimensions of fairness is strong enough to stimulate customer satisfaction, thus indirectly contributing to the intention to continue to use IS. This study applies a conceptual model in which the perceptions of service fairness are integrated with the PAM based on Bhattacharjee’s (2001b) model (Figure 1).

METHODOLOGY

Scale items were adapted from existing literature with some modification and supplementation reflecting the specific IS context and the targeted users. Items for basic PAM were developed by Bhattacharjee (2001b) and several other researchers e.g., [14][31][47]. Fairness items were adapted from a number of works, but generally follow [7][29][32][45]. All items were reworded to relate specifically to customer relationship management (CRM) SaaS, called ‘the software’ throughout the survey questionnaire.

The initial questionnaire was reviewed by a panel of experts (n=7) from IS academia and industry IS management, followed by a small pilot survey (n=60). This pilot showed good results on the basic PAM concepts, but the four service fairness concepts were not distinct and some had low reliability. An additional Delphi study was done with another panel of experts (n=10), who were practitioners in IT service management. The main survey was carried out after adjusting some fairness questions based on this Delphi phase.

Sample and Data Collection. The unit of analysis for pilot testing and the main study was individuals in small and medium sized enterprises who use business-to-business (B2B) CRM-SaaS in the cloud environment. For both the pilot and the main study, an online professional marketing research service implemented an online survey. This research service has access to upwards of over four million respondents worldwide. The panel members were recruited according to pre-qualify characteristics, and the research service used opt-in panel members, who have a choice whether or not to answer any specific survey. The respondents were SaaS users in B2B applications.

The web-based survey is an appropriate choice for this study due to the characteristics of the research subject (i.e., CRM-SaaS subscribers access the software via Internet on a daily basis) [1]. When the sample has frequent easy access to the Internet, they are more comfortable and likely to answer on the Internet. Therefore, web-based surveys may have no restricted geographical location, gain higher responses, and extract longer and more substantive quality answers than a mail survey [4][40].

RESULTS

Recruitment e-mails were sent to 31,015 prospective panel members nationwide in the USA, identified from company databases of full-time employees working in organizations. The first response rate was 11.58% (3,591). Four stringent screening questions reduced this to 490 questionnaires, at a response rate of 1.58%. The screening questions ensured that

- The respondents used a CRM software over the Internet in their work place; a list of specific, common

CRM-SaaS was used to make sure the applications were comparable.

- b) The respondents' organization had used the software more than 2 years, so that their answers are about continuance, rather than adoption and the trial use period.
- c) Respondents used the software at least once a week for their work, which is considered using the software as part of normal routine activity, and
- d) The respondents had contacted the software service provider for support. If they have not had any interaction(s) with the software service provider and/or the software service provider personnel, they did not qualify to take part in the survey.

Since the response rate was relatively low, tests for non-response bias were performed by comparing answers on the last quartile of the responses to come back with those of the first quartile [28]. There were no differences in the mean of any item in the model constructs, and only two differences in the variances. This indicated that non-response bias was not a significant problem and the survey was able to achieve adequate data in this research.

Demographic characteristics of the 490 respondents are: males constitute 61.22% of respondents. The majority (64.70%) is in the age range from 30 years to 50 years old, and nearly ninety percent (88.98%) had over 5 years of working experience. The most common positions were operating staff (16.73%), supervisor (15.51%) and sales representatives (13.06%). Half of the respondents (50%) were from organizations employing between 51 to 500 employees. Respondents from the business services industry (51.84%) made up the highest percentage. In summary, the sample constituted an experienced working-age group, with responsibility at their present company requiring frequent use of the CRM software, and who interact with the software service provider.

Table 1 presents the descriptive statistics for the composite variables used, including mean, standard deviation and reliability (Cronbach's alpha) for each construct measure. The internal reliability of the measures ranged from .830 to .938 for the post-acceptance model and from .906 to .943 for the four service fairness dimensions. All the measures included in the questionnaire showed adequate levels of initial internal consistency reliability ($> .70$) [21][34].

Standardized estimates and standardized regression weights are presented in Figure 2 and Table 2. The first set of hypotheses ($H_1 - H_5$) was developed to test if the PAM can be applied in this research context. All five hypotheses tested were supported. The findings suggest that this research context supports the PAM [5].

The structural model was accepted and the chi-square was significant (chi-square = 1533.550; $df = 362$, $p = .000$, relative chi-square = 4.236) (Figure 2). The path coefficients for the structural model are shown in Table 2. The relative effect (standardized regression weights) between

independent and dependent variables shows a strong path (with statistical significance) for all hypothesized relationships, except between informational fairness and satisfaction, which was significant but in the opposite direction from the hypothesis.

Table 1: Construct descriptive statistics and reliability

Variable (Number of items)	Mean	S.D.	Cronbach's Alpha
Usefulness (4)	5.64	1.086	.938
Confirmation (3)	5.40	1.011	.830
Continuance intention (3)	5.58	1.041	.893
Satisfaction (4)	5.51	1.088	.929
Systemic fairness (8)	5.50	0.991	.943
Configural fairness (4)	5.53	1.019	.906
Interpersonal fairness (6)	5.63	1.003	.937
Informational fairness (4)	5.55	1.030	.908

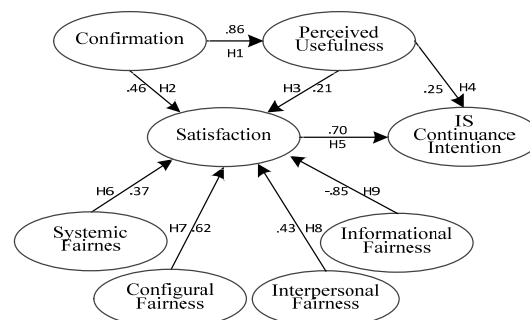


Figure 2: A full model fit

Table 2: Standardized path coefficients

Dependent (R^2)	Determinant (Hypothesis)	Coefficients (P-value)
Usefulness (.735)	Confirmation(H_1)	.857 (.000)
Continuance intention (.774)	Usefulness(H_3)	.254 (.000)
	Satisfaction(H_5)	.702 (.000)
Satisfaction (.753)	Confirmation(H_2)	.463 (.000)
	Usefulness(H_3)	.207 (.023)
	Systemic fairness(H_6)	.371 (.002)
	Configural fairness(H_7)	.623 (.000)
	Interpersonal fairness(H_8)	.429 (.049)
	Informational fairness(H_9)	-.849 (.009)

Among the second set of hypotheses ($H_6 - H_9$), analysis of path coefficients indicates that three of four hypotheses ($H_6 - H_8$) are supported. The influences of systemic fairness (coefficient = 0.371), configural fairness (coefficient = 0.623), and interpersonal fairness (coefficient = 0.429) on satisfaction were positive and significant. However, interestingly, the impact of informational fairness on satisfaction was negative and significant (coefficient = -0.849) (Table 2). The impact of the endogenous variables is high, as indicated by the R^2 values. The highest R^2 appeared in IS continuance intention (77%) and the next highest R^2 were shown in satisfaction (75%) and perceived usefulness (74%) (Table 2).

CONCLUSION

The first objective of this study is to examine whether continued usage in cloud computing can be determined by the variables in the post-acceptance model. The results, from the first part of the research model ($H_1 - H_5$; top part of Figures 1 & 2) show that all five hypotheses are supported.

The second objective ($H_6 - H_9$; bottom part of Figures 1 & 2), is to propose a theoretical model that can explain and predict individual satisfaction in relation to service fairness perceptions. In other words, we explore the relationship between service fairness and customer satisfaction, to see whether service fairness issues has some indirect impact on continued use of the system through satisfaction. The findings show positive and significant paths from systemic, configural and interpersonal fairness to satisfaction, consistent with findings in the meta-analysis in Colquitt et al (2001)[13][19]. That is, satisfaction with the service delivery process is affected by the processes (systemic fairness), value outcome (configural fairness), and the fair and respectful behavior of the service provider personnel toward customers (interpersonal fairness).

The path from informational fairness (sharing of information) to satisfaction is negative and significant. It was the only one of four types of fairness that shows a contradiction in the hypothesized relationship of fairness. There are several possible reasons for the contradictory result between informational fairness and satisfaction. Some of the problems may come from multicollinearity, with relative high correlations between informational fairness and the other three fairness dimensions (0.874, 0.817 and 0.903), substantially larger than other correlations among four service fairness dimensions. However, the strength of the relationship suggests that the hypothesis is incorrectly stated, i.e., that this relationship is not understood very well.

At this point, we do not have a good explanation for this result. We do point out that there have been several other studies showing unexpected results regarding informational issues. For example, it seems that organizational customers view information sharing capabilities as a barrier instead of a benefit in internet banking [43]. Prior research has found a negative and significant relationship between informational fairness and an exchange relationship [26]. Other research in various contexts has failed to find any relationship between informational fairness to satisfaction e.g., [24][42]. This issue clearly needs additional research.

Nevertheless, the basic PAM was shown to hold, and the basic concept that various dimensions of service fairness have an impact on satisfaction in the basic PAM was also confirmed. Of course, this study does have several limitations. First, the scope is limited to the context of SaaS enterprises in a cloud computing environment. While this is an important and increasingly widespread context, it would be beneficial to replicate the study to broaden the contexts. For example, related sorts of environments would be public SaaS, Infrastructure-as-a-Service (IaaS) or Platform-as-a-Service (PaaS) applications.

Second, this study employed a one-sided survey response from external customers using SaaS in the cloud computing environment. Further study using a dyadic approach could gain in-depth understanding on the responses from both customers and service providers; notably, by examining the record of the service interaction to examine how specific

details of the service interaction correlate with the fairness issues. Finally, this research was cross-sectional, surveyed at one period in time. The findings can only reflect that specific time, but satisfaction is also the product of cumulative experience, and may change over time.

The limitations help to define some potential directions of future research, but we also point out a couple of other useful areas for future work. First, IS in a large organizational context, where they have their own system and the IS service is for internal customers, is a potential environment to be investigated. Internal organizational employees account for a large percentage of IS users. Studies of these extrinsically motivated users may contribute many theoretical insights to the IS post-acceptance model. Second, testing the research model with different types of IS context will improve the generalizability of the empirical results of this study.

This research has offered an important contribution by integrating theories of service fairness with the IS continuance intention domain. Service fairness does have a significant impact on satisfaction, and thus, indirectly influences IS continuance. This suggests areas that managers of IS support services need to consider, and points out areas that research on IS management must account for. Service fairness is clearly an important issue for IS users.

Appendix 1A: Items for the basic PAM

Perceived usefulness

- 1 Using the software improves my work performance.
- 2 Using the software increases my productivity at work
- 3 Using the software enhances my effectiveness at work.
- 4 Overall, the software is a useful tool at work.

Confirmation

- 1 My experience with using the software was better than I expected.
- 2 The service level provided by the software service provider was better than I expected.
- 3 Overall, most of my expectations of using the software were confirmed.

IS continuance intention

- 1 I intend to continue using the software rather than discontinue its use.
- 2 I intend to continue using the software rather than using an alternative.
- 3 If I could, I would like to continue using the software.

Satisfaction

- 1 I am very satisfied with the overall experience of using the software.
- 2 I am very pleased with the overall experience of using the software.
- 3 I am very content with the overall experience of using the software.
- 4 I am absolutely delighted with the overall experience of using the software.

Appendix 1B: Items for service fairness

Systemic fairness

- 1 The software service provider was consistent with the service procedure according to the agreement.
- 2 The software service provider provided a level of service to me equal to that provided to other departments or companies.
- 3 The software service provider kept complete and accurate records of my problems concerning the software.

- 4 The software service provider has a knowledge-based system to provide solutions to my problems concerning the software.
- 5 The software service provider effectively managed my problems concerning the software from initial notification though to reasonable resolution.
- 6 The software service provider was able to identify and correct any problems that resulted from their own errors.
- 7 The software service provider was capable of performing all the duties covered by the agreement.
- 8 The software service provider behaved in an ethical manner in terms of fulfilling the spirit of the agreement.

Configural fairness

- 1 The software service provider delivered the service to all individuals in my company equally.
- 2 The software service provider delivered desired solutions to all individuals in my company equally.
- 3 The software service provider delivered reasonable results to all individuals in my company equally.
- 4 The software service provider met the needs of all the individuals in my company equally.

Interpersonal fairness

- 1 The software service provider personnel treated me with respect.
- 2 The software service provider personnel treated me with consideration.
- 3 The software service provider personnel treated me sincerely.
- 4 The software service provider personnel treated me in a polite and courteous manner.
- 5 The software service provider personnel were aware of my rights as a customer.
- 6 The software service provider personnel used proper or appropriate language.

Informational fairness

- 1 The software service provider offered reasonable explanations concerning the service.
 - 2 The software service provider explained the service procedure thoroughly.
 - 3 The software service provider was truthful in all communications to my company.
 - 4 The software service provider tailored their explanation to my needs.
-

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Towards a Reference Framework for RFID-enabled Garment SC Visibility

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ABSTRACT

In the current environment organizations can no longer compete on price alone. Supply chains are becoming important, where efficiency and effectiveness play the pivotal role. RFID is a highly heralded technology in the supply chain field, which can synchronize the information flow with the material flow. However, organizations are still not widely adopting it, as the industry is missing compelling business cases to illustrate how to implement the technology and how it actually can bring benefits to the business. In this study we develop and demonstrate an innovative information infrastructure to facilitate a smooth supply chain operation. The infrastructure is designed based on an in-depth case study of a typical complete garment supply chain. SCOR model is used to ensure that the design is applicable in various supply chain set ups.

Keywords: RFID, Supply Chain Visibility.

Introduction

The competition in the garment industry is keen. Brand owners are continuously facing with the inevitable rising labor costs in China. No doubt, competitive advantage in the industry is shifting further into the leverage of supply chain efficiency and effectiveness [1]. Towards that end, the design-to-market cycle must be significantly shortened requiring tighter collaboration and information sharing among supply chain partners [2]. RFID-based technology is the key IT enabler to advance supply chain performance and real-time visibility.

However, the industry is still facing a low RFID adoption after the Wal-Mart mandate [3]. The RFID adoption has been slow due to organizations are missing a compelling business case to illustrate the actual benefits of RFID [4]. The few published business cases are specifically designed for a certain situation, which makes it difficult to apply to other environments. Besides, there are little systems available which readily enable RFID information sharing across supply chains.

The objective of this study is to:

- Design a RFID-enabled infrastructure to enable seamless supply chain operations
- Develop a RFID reference framework for the garment industry
- Illustrate the RFID benefits on a supply chain level

Literature review

The RFID discussion started in 2004, when major retailers mandated their top suppliers to attach RFID tags to their products [5]. Yet, the adoption landscape so far has dotted with results observed at the company-level, lacking a holistic view of the supply chain [6]. We see examples of application of RFID in supply chain partners of the garment industry. For example, the Lawsgroup uses RFID technology to manage raw materials and in-house products of 15 Asia sites [7]. Earlier, DHL Solutions Fashion uses RFID to track item-level fashion items in a DHL distribution center near Paris [8]. UK food and clothing retailer Marks & Spencer, was assessing the use of RFID item-level tagging of three different packaging (hangers, flat in toes and boxes) at a store near London [9]. In each case, ROI is the main focus at the corporate level, not so much of looking at benefits gained with respect to efficiency in a complete supply chain as a whole.

Therefore, we currently lack systems to integrate supply chain partners by sharing information. This is actually where the true potential lies in supply chain management. Traditional supply chain management literature, for instance, discuss that efficient information sharing can reduce the supply chain inventory [10] [11]. The full potential of RFID technology in a complete supply chain remains elusive, with the lack of compelling business cases on a supply chain level [4]. As a matter of fact, organizations are too much influenced by the RFID pioneers [12] and follow the bandwagon by replicating the pioneers' RFID applications into their own organization. This can lead to disappointing results, as mindlessly following the leaders does not always fit the organization's need [13]. Thus in order to gain supply chain efficiency and visibility, supply chain partners must reach beyond the organization boundaries and effectively share supply chain information.

Methodology

The main objective of this study is to develop a RFID-enabled information sharing platform for supply chains. However, the current literature lacks examples of how information is shared among supply chain partners and platform. Therefore an in-depth case study is used as an illustration of a typical supply chain. This research methodology is well suited for this problem, as it can bring out the problems that arise during information sharing. Moreover, case studies can provide information about a given context and eventually deduce theories from it [14].

The limitation of in-depth case studies is that the results are only applicable to the case study. We minimize this limitation by utilizing SCOR model (Supply Chain Operations Reference) to analyze the supply chain. SCOR can be seen as a universal language to describe supply chains and is a benchmark to measure supply chain performance [15]. By using SCOR organizations can better compare the case study's supply chain and reflect whether it is applicable in their context.

Case studies

In this study, our objective is to address the sustainability of competitive advantage of an existing complete supply chain in the garment industry with RFID-based enabling technology. The supply chain in question handles reputable high-end men's fashion wear. The partners in the supply chain are a brand owner, fabrics and trims suppliers, parts suppliers, garment manufacturers, distribution center and retailer shops (see Figure 1). In this garment supply chain the brand owner sources all the fabrics and trims to ensure a high quality standard. The suppliers are usually

located in Europe and South-east Asia. All the fabrics and trims will be first received in the brand owner's despatch warehouse, which is located in Hong Kong. Subsequently, the despatch warehouse ships the fabrics and trims to parts suppliers located in Shenzhen, where the fabrics and trims are produced into parts. Once finished, the Shenzhen parts supplier ships out the parts to Hong Kong where the parts are assembled together in the HK factory, also owned by the brand owner, to form the final garment. However, in some cases final touch-ups are required, which are performed by the Shenzhen parts suppliers. Besides, not all garments are produced in-house and some products are sourced from third parties, who are mostly located in China, again the fabrics and trims are sourced by the brand owner in order to ensure the high quality standards. The finished garments will be stored in the distribution centers, located in Hong Kong, where it awaits to be shipped out to the Hong Kong, China, and Taiwan retail stores.

The supply chain shows that a close relationship between the brand owner and the other supply chain partners is required for a smooth supply chain operation. The brand owner can be seen as the orchestrator of the supply chain. Information sharing is mainly one-sided where the brand owner places orders with the supply chain partners. The order placing is usually done through fax and email. The supply chain partners must where possible adjust their planning to the brand owners plan (see Figure 1). However, supply chain partners cannot always meet the brand owner's plan, which causes delay in production and can lead to lost sales at the retail shops. The brand owner, therefore, must keep a high inventory in the distribution centers to satisfy the volatile demand of the fashion industry. The brand owner typically plan one year ahead, as the lead-time of the fabric can take up to six months. The long fabric lead-time and the high dependency of the supply chain partners cause the supply chain to be highly inflexible. Besides, it is difficult for the brand owner to keep track of the unused fabrics and trims at the SZ parts supplier. Fabrics roughly account for half of the production cost and left-overs cannot always be used in the next seasons.

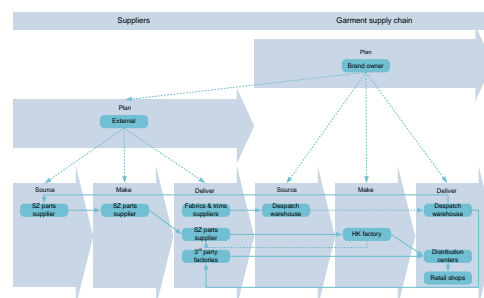


Figure 1. Garment SC case – SCOR level 1

RFID-enabled supply chains

We used SCOR level 2, 3, and 4 to analyze our case study. In SCOR level 2 we discovered that the supply chain utilizes mainly uses a make-to-order configuration, but due to the supply uncertainty of the fabrics and parts, make-to-stock configuration is used at certain points. In SCOR level 3, we analyzed which points are suitable for RFID. The SCOR level 3 diagram of the SZ parts supplier is shown in Figure 2. RFID-enabled SC processes – SCOR level Figure 2. These processes are carefully chosen to implement as they can improve the SC operation and visibility. For instance, the traditional S2.2 – receive fabric requires a manual verification of the fabrics in order to verify whether the correct fabrics are delivered and in the right amount. However, with RFID this is all automated by scanning the RFID-tagged fabrics. The system will automatically verify against the ASN whether the items are received correctly and timely. Moreover, the RFID reading in S2.2 also contributes to the SCOR defined metric Order Fulfillment Cycle Time. The RFID readings are actually all tied up to SCOR defined metrics, which can provide the supply chain partners with a supply chain dashboard. The dashboard can provide the user with a real-time performance assessment of the supply chain. We initially look at the Order Fulfillment Cycle Time, which measures how long it takes for materials to go through the supply chain, and Perfect Order Fulfillment metrics, measures whether the supply chain partners can live up to their commitments. SCOR level 4 is used to analyze how and which operations are changed due to RFID.

In order to provide a better guidance to potential RFID adopters we classified the RFID-enabled SCOR processes according to a RFID application applications typology [13], see Table 1. The analysis shows that RFID identification, typically help supply chain partners to improve efficiency by reducing the handling time. RFID assertion keeps track of the materials to ensure that the demand can be fulfilled, e.g. is adequate fabrics available to satisfy demand. RFID synchronization can provide real-time information to other supply chain partners on whether/how the demand is fulfilled, e.g. is a certain order fulfilled or delayed. RFID ownership can provide the supply chain partners with a holistic view of the current supply chain status, e.g. what is the order fulfillment cycle time of my supplier.

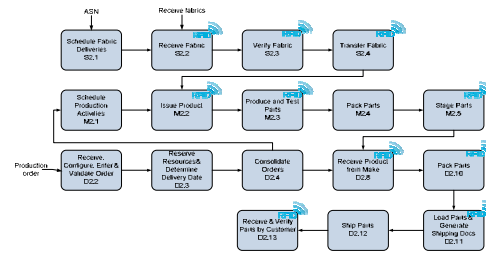


Figure 2. RFID-enabled SC processes – SCOR level 3

Table 1. RFID-enabled SC processes by RFID applications typology

RFID applications typology	RFID-enabled supply chain processes
Automation	D2.8, D2.10
Assertion	S2.4, M2.3, M2.5
Synchronization	S2.3, M2.2, D2.11
Ownership	S2.2, D2.13

In order to allow the information sharing we needed to develop a platform that allows supply chain partners to share RFID and supply chain information. After a careful evaluation of the existing applications we noticed that none of the existing applications can satisfy our requirements. We needed a platform that allows:

- Data integration - Sharing RFID information on its own has little meaning to supply chain partners as it is merely an electronic number (EPC code). The challenge therefore is to see how this information can be combined with the existing supply chain information [16].
- User expansion - Supply chains may look like a static environment, but this is not entirely true. Volatile supply networks might be a more appropriate term, as supply chains can adapt and change over time [17], and besides many different supply chains exists within an organization.
- Information representation – Managers have little value in knowing where a particular product is on a specific time. We therefore need to present our information in such a way that it is useful to the user and prevent information overflow of RFID data [18].

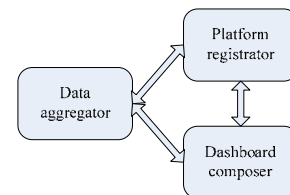


Figure 3. Information sharing platform architecture

In order to satisfy RFID-enabled supply chains requirement we developed a visibility platform consisting of the following three components (see Figure 3):

The data aggregator is intended to capture and combine the existing supply chain data, e.g. ERP data and RFID data. The component is designed in such a way that it becomes platform independent. This is done by analyzing which information needs to be shared between supply chain partners to enable a smooth supply chain operation. The information is converted to XML and communicated to the platform based on SOA architecture.

The platform registrar allows user to easily join or leave the platform. The purpose is that supply chain partners can join the platform at any given time and allows them to share their supply chain and RFID data. In return the supply chain partner can obtain the relevant data from the supply chain partners. When a supply chain partner is not a part of the supply chain anymore, the platform will revoke the information sharing privilege. XACML is used to ensure that information is only disclosed to bona fide partners.

The dashboard composer is the representation layer of the collective supply chain and RFID data. We aggregate the data to represent it according to the SCOR processes and SCOR metrics. This presents the users with a real-time dashboard view of the supply chain status and its performance. Moreover, many supply chain partners are unaware of what information they want to view. Therefore, we made the platform as flexible as possible, allowing the users to create their own supply chain information views. AJAX is used to ensure the user flexibility and that the user information is real-time updated in web browsers according to the RFID events.

Concluding remarks

In order to facilitate effective and efficient supply chains, a solution is needed to provide supply chain information visibility. This study proposes a framework/guideline for adopting RFID in supply chains and an information sharing platform. A case study of a complete garment supply chain is utilized to portray a typical garment supply chain. The case is in-depth studied by the use of SCOR, which improves the applicability to other supply chains. We believe that the framework can function as a guideline for potential RFID adopters and the visibility platform can provide design principles on RFID-enabled information sharing.

This study is an initial step to explore how RFID can benefit supply chains. We are currently still capturing supply chain and RFID data. With the data more insights can be provided by our framework, e.g. with an analysis on cost versus benefits per RFID applications typology or even per RFID-enabled process. The study will also suggest how RFID can alter the supply chain processes and ultimately lead to a RFID-enabled SCOR model. The visibility platform is still in

development and the user created information views can give us a better understanding of what supply chain visibility means for different supply chain partners in the garment industry. Albeit the study is still in progress we can already observe that information is now shared more effectively. For instance, the brand owner now has a better control on their fabric management, the production status of each supply chain partner is now shared and allows partners to plan ahead of time, and many laborious manual processes are now automated with RFID. A limitation of the study is that it is based on one single in-depth supply chain case study. However, we are currently analyzing the applicability of our study in other garment supply chains and other industries. Besides, SCOR serves as a supply chain operations framework and the framework should therefore be applicable to other supply chains, as we analyzed RFID on a generic level 3. In the end we intend to develop an RFID-enabled SCOR framework, which can guide potential RFID adopters. The framework should describe on a generic level which supply chain processes can be RFID-enabled and how the supply chain can/need to be changed due to RFID. Since we use SCOR we can provide a more complete assessment of the actual RFID benefits. We do not only intend to look into the typical ROI, but we will rather look into the SCOR defined metrics, which are intended to measure the supply chain performance. Finally, we intend to develop an innovative RFID-enabled information sharing platform, which can facilitate a smooth supply chain operation based on the RFID-enabled SCOR framework requirement. A set of design principles of the RFID-enabled information sharing platform will be developed, as a reference for potential RFID-enabled system developers.

The name of author(s), affiliation(s), address(es), telephone number(s), fax(es), and e-mail address(es) should be set flush left with initial caps. Try not to use titles such as Dr., Professor, etc.

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IMPACTS OF LOCATION AND ANIMATION ON INTERNET BANNER'S CLICKTHROUGH RATES

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Abstract

Internet banners have been under examinations in order to learn which design features could lead to high rates of clickthrough. Previous research has reported effects of banner animation and banner location; however, results are still inconclusive. This study thus attempts to compare clickthrough rates (1) between those on animating vs. stay-still banners and (2) between those on banners placed on top vs. in the middle of a screen.

Data from a quasi experiment confirm (1) the difference between the clickthrough rates on animating banners and those on stay-still banners is not significant, but (2) the difference between the rates on banners positioned on the top and those positioned in the middle of the screen is statistically significant at a 0.05 level.

In addition to extending insight into design issues of Internet banners practicing in Thailand, practitioners could adjust their online advertising campaigns based on the study's findings.

Keywords: Internet banners, animation, location, clickthrough rate, quasi experiment.

1. PROBLEM STATEMENT

According to several estimates, online advertising revenue will (1) outperform typical broadcasting channels, and (2) be at least US\$ billion in 2011 [15]. Among various forms of this online commercials, banner advertisement has become one of the most common formats [5]. The banner advertising refers to a display of marketing messages in any form of presentation that appears on a computer screen while ones visit a webpage [18].

Given the standard tools for online advertising campaigns, banners have received remarkable attention on design issues [14, 29]. That is, both researchers and practitioners would like to know the best design that could significantly contribute to the banner's high effectiveness. Among a few indicators in a banner effective matrix [12, 24], a clickthrough (or a clickthrough rate) has been commonly accepted because of its valid reflection of advertising success and its simple measurement. Defined in this study, the clickthrough is the number of click a banner has received. It could be

measured per a time interval (e.g., the number of clicks per hour) or per a campaign (or a project). The clickthrough rate is then the number of click divided by the number of those who had (1) visited the page in which the banner appeared and (2) presumably seen the banner.

Past research has examined a few number of design features that may lead to a banner's high performance [5, 7, 11, 20]. Two of those features particularly of this study's interest are banner location and banner animation. This banner location refers to different positions on a screen where a banner appears. Given a banner's commonly rectangular shape, five locations could be on the top, the bottom, the left, the right, or in the middle, of a webpage or the screen. Based on Nichpornkul's [18] lab experiment, a banner on the top received the highest numbers of clicks, compared to the bottom, the left and the right locations. Tangmanee and DejArkom's [27] field experiment was based on Nichpornkul's findings. Attempting to compare clickthrough rates between those on the top position and those in the middle location, they was able to confirm that the top location still received the higher clickthrough rate than those at the middle position. Although these two projects of Nichpornkul's [18]; and Tangmanee and DejArkom's [27] are useful, they seem outdated, thereby, having validity concern. More recently, Zhang [31] compared the effect from banners positioned on the left and that from banners positioned on the right on information-seeking task. Although far from online commercial task, Zhang [31] discovered that the left location had more serious negative effect on the task than the right location. Ryu and coworkers [24] found, based on their controlled experiment, that visitors admitted the banners on the left position were more likable than those on the right position. In addition, Owens and coworkers [20] attempted to verify the banner blindness condition using eye-tracking devices and found that the right location were missed more often than the ones on the top position. Since Zhang's [31, 32] projects were on the information-seeking setting and Ryu and coworkers' [24] work employed a consumer's preference on banner as an indicator for advertising success, the question on which location Internet banners could earn the highest numbers of clicks remains unanswered. Given the controlled lab experiment's major drawback on

validity issues, we had contacted a number of websites to see a possibility of running a field experiment. A few actual websites we contacted accept to place on their homepages only the banners positioned along the screen's horizontal level. According to these webmasters, the screen's left section is typically reserved for menu placement. In addition, they discouraged us to choose the right location since visitors may set their screen differently and there then is a chance that a banner could be off screen on the far right. As a result, our focus in this study is on the top and the middle locations. This decision was also based on findings in a number of reports [18, 20, 27]. We excluded the bottom location since the banner on this location will appear last or after other sections on screen have been loaded. The bottom banners might thus gain visitors' least attention.

Based on previous research [14, 31], banner animation is defined as motion of any kind visually appearing on a webpage and this motion is visually associated with the banner. In general, animation could make a banner look "cool" [14]. Yet, it could be annoying and distracting [19]. Nonetheless, a banner often employs animation mainly in order to draw a visitor's attention with hope that the visitor will eventually click on it. Indeed, past research has confirmed this effect to some extent. Hong and colleagues [13] found that flash animation "does attract user's attention (p.60)." Yet, in the same study, they also confirmed that the visitors were unable to recall the content presented via the animation. Also, Cho and coworkers [8] discovered that the higher forced exposure to animated banners may lead to the higher clickthrough rate. Similarly, Chandon and Chtourou [34] confirmed the significant effect of animation on a clickthrough rate, although the effect amount is marginal. Chen and coworkers [7] found that animation on banner led to visitors' favorable attitude.

However, findings from past research seem to confirm the negative effect of animation. Hong and colleagues [13] found that flash animation in an e-commerce setting could not enhance recall of what appears on the banner. In addition, the effect of this flash animation depends on the tasks visitors have during online session and their experience [13, 28]. Highly experienced visitors tend to overlook at animation and concentrate on the banner content better than the novices [10]. Zhang [31] confirmed that animation significantly deteriorated information-seeking performance. In her other experiment, Zhang [32] validated that (1) the timing of animation (e.g., appearing at the beginning or task or popping up later) and (2) the rhythm of animation (e.g., staying on during the whole task or appearing on-off repeatedly) had

significant impact on performance of those information-seeking task. However, Hong and coworkers [13] identified two minor flaws in Zhang's [32] work. Her tasks and her animation seemed unrelated to online commercial. Also, subjects in Zhang's [32] work had to deal with the large number of tasks which thereby could deteriorate their performance, in addition to those from various conditions of animation. Even though a few studies confirm the effect of animation on online advertising performance, Yoo and colleague [33] indicate its ceiling effect. That is, if content is too much animated, the banner may not at all attract visitors' attention. Some visitors admitted they hated those banners with the high amount of animation. Moreover, based on their experiment, Sundar and Kalyanaraman [26] ascertained that slow animation was related to viewers' more favorable attitude than quick animation.

Drawn from previous literature, deploying animation is however still effective in attracting viewers' attention or even increasing their arousal. However, how to apply it in order to gain the high rate of clickthrough seems much challenging. Past research has reminded us to some extent about the timing, the rhythm or the amount of animation on the banner content [26, 27, 30, 32]. Yet, their results are still inconclusive. Hong and coworkers [14, p. 1467] was among the first attempts to focus on "non-banner-ads animation." According to them, the effect of animated banner content could be confound by animation around the banner, set aside viewers' perceptual and cognitive traits. They confirmed that this non-banner-ads animation did attract viewers' attention. Following Hong and colleagues' [13] suggestion, we decided to validate what the effect would be if the banner itself is animated but its content remains unanimated. Examining the effect of animating vs. stay-still banners, together with that of its locations (e.g., top vs. middle locations), on clickthrough rates is thus the study's unique contribution to the field of online advertisement.

2. OBJECTIVES

Based on our elaboration in the previous section, here are the study's two objectives:

- To compare clickthrough rates between those on banners positioned on the top and those on banners positioned in the middle of screen, and
- To compare clickthrough rates between those on animating banners and those on stay-still banners.

3. RESEARCH METHODOLOGY

Responses to the study's two objectives are from a field experiment. In a real setting, we attempt to do our best in manipulating two independent variables (i.e., two banner locations and two conditions of animation) and controlling other variables (e.g., banner content or a website hosting this banner) while observing whether the differences in a dependent variable (i.e., clickthrough rate) would be statistically significant. Unlike previous studies that measured the intention to click, we develop software to calculate the actual rate of clickthrough.

The following sections detailing methodological issues are (1) the hosting website and the banner, (2) experimental units and data collection, (3) reliability and validity issues, and (4) data analysis framework and hypothesis statements.

3.1 The hosting website and the banner

With collaboration from dusitcenter.dusit.ac.th, we were able to place banners in this website during mid-October to mid-December in 2010. Once we had the website agreement, we started the development of these banners. According to the two independent variables: banner location and banner animation, the design of banner must be nearly identical across values of these independent variables. This identical design is to enhance the experiment validity. That is, if the clickthrough rates are significantly different, it must be a result of the banner animation or the location, but not that of other uncontrolled factors.

Given the educational institute website (dusitcenter.dusit.ac.th), we decided to use the banner to advertise the school's sports facility. Basically, the banner would have a static, horizontally shaped, and embedded design of the 490*80 pixels. Its development was via Adobe Photoshop CS3 and Adobe Flash CS3 as designing tools. Figure 1 illustrates this basic design. To manipulate two locations of banner, we place the banners on the top and in the middle locations of the website homepage as seen in Figures 2 and 3.

Regarding the animation, our focus is not to animating content on the banner since a fair amount of past research has not been able to validate this effect (Tangmanee & DejArkom, 2003). We therefore speculate that the amount of animation, if occurring to only its content, is not so drastic to lead one's attention to an eventual click on the banner. Consequently, we attempt to increase the amount of animation to the extent to which the banner itself is animated. The banner in this study is thus shaking for two minutes in every

five minutes of its display. Once shaking, the left and the right tips of the banner in Figure 1 will swing up and down for about 15 degrees, much like a seesaw board. A small survey with 25 graduate students confirmed that they all noticed the animation and accepted the idea of an animating banner, its content.

3.2 Experimental units and data collection execution

Experimental subjects in this study are actual visitors to the dusitcenter.dusit.ac.th website during the two-month data collection. Although we may not have much control over the subject recruitment, the actual context of this experiment would enhance the study's external validity [1].

Nevertheless, we were able to manipulate the display of banners. These banners have four similar designs (2 banner locations x 2 banner animation). We had developed program to (1) manage the display of these banners and (2) record the number of visitors and the number of clickthrough, on which we subsequently calculate the clickthrough rate. This program will manage the banner display so as to minimize any chance of bias. Suppose we display one of these four styles of banner during the weeks of course adjustment at this dusit college when most of students must access to this website for possible course changes. It is thus more likely that this style of banner receives the relatively high rate of clickthrough. Yet, this high rate is not a result of different locations or different animations. Therefore, the program will select one of the four banners in random to display during six hours of one day. The display order is also in random. It then means within a day the four styles of banner will have comparable chance to appear on the hosting website and the experiment will run for about 60 days or two months. This would finally yield the total of 360 hours to display each style. During each six-hour session, the program will examine a visitor's IP address. Then, it will check if there is any visitor from this IP address within the past 30 minutes. If this is true, the program will assume this visitor is the same person who had visited the website during the last 30 minutes and the program will not record this visit. Should the visitor be new, the program will add one visitor and will wait for this visitor to click on a banner within the first 30 minutes of his visit; otherwise, the program will record no click from this visitor. The 30-minute interval used to determine (1) if a visitor is new and (2) if a visitor is going to click is from past literature [6, 23].

Figure 1: The banner's basic design**Figure 2: The banner placed on the top location**

According to the experimental condition, there exists possibility that (a) there are visitors but none clicks on a banner or (b) there is no visitor during the six-hour session. Indeed, 3,812 out of 8,640 records from the entire experimental sessions had no visitors. This is the condition under which a calculation of a clickthrough rate is impossible. This thus leaves us the total of 4,828 valid records for further analysis.

3.3 Reliability and validity issues

We strived to conduct a fair experiment in an actual setting in order to validate the impact of (1) two banner locations and (2) two banner animation patterns on a clickthrough rate. We

had developed software program to place banners in the manner that could yield reliable and valid data for the validation. Such our effort include the followings.

Instead of having a lab-controlled experiment, we opted to do a field experiment with support from one actual website. The main reason that a lab setting was not our choice because the condition in the lab seems very artificial. For instance, we had tried to figure out what task we want subjects to do in the lab that could replicate actual use of the Internet but none of the solutions work well. So, we believe this field experiment would offer more valid conclusion than the lab setting.

Figure 3: The banner placed in the middle location

Given a variety of browsers, we decided to have a simple embedded banner with static design accessible through by major browsers (e.g., Internet Explorer, Firefox, or Chrome). This is in order for all visitors to be able to visit, enjoy contents on the hosting website and perhaps click on the banners. Had visitors dropped by the website but they had been unable to see the content or to click for inaccessibility reason, the conclusion about the effect could have been distorted.

We managed the experiment conditions via the software program so the display of all four-style banners could be part of an unbiased experiment. All four designs could then appear fairly in all sessions during the two-month data collection. Any bias due to the time of appearance was minimized. Using ASP.NET, the program is embedded in a reliable service that could accommodate the C# language and the ACCESS database management system. In addition, it would be improper to assume that the click will take place in a short moment after the visit. As such, we allow a 30-minute interval for this. Should a visitor not click on a banner during the first 30 minutes of his visit, it would be reasonable to assume that he will never click [23].

3.4 Data analysis and hypothesis testing

We will present the overall picture using descriptive statistics. To respond to this study's two objectives, we intend to test two hypotheses that attempt to verify if the clickthrough rates are statistically significant across (1) two banners located on top, and in the middle, of a webpage and (2) two patterns of animation (i.e., animating vs. stay-still banners). The statistical analysis technique would be the independent t-test. However, if the clickthrough rate is not normally distributed, we must opt for a nonparametric test which is the median test.

4. RESULTS

The two-month field experiment that displayed four styles of banners on dusitcenter.dusit.ac.th yields 4,828 usable data records for the analysis. Based on Table 1, the average of a clickthrough rate is 0.007591 or 0.7591%. That is, at least one in 200 visitors had clicked on a banner. Compared between two conditions of animation in Table 1, 0.8834% and 0.6375% are the average of clickthrough rates on animating and stay-still banners, respectively. Similarly, 0.4643 and 1.0483% are those on banners located on the top and in the middle, of the webpage, respectively.

Prior to testing hypotheses, we examined whether the clickthrough rate is normally distributed. Results in Table 2 confirmed that the distributions

are not normal. We therefore had to rely on a median test to test if the difference of clickthrough rates between those on animating banners and those on stay-still banners is statistically significant. The test's P-value is 0.921, indicating that the difference is not significant. However, the same test to verify if the difference between clickthrough rates on top banners and those on middle banners has the P-value of 0.001,

indicating that this difference is statistically significant at a 0.05 level.

Note that among the total of 8,640 records from the experiments, only 4,828 are usable. The unusable records are from the sessions in which there was no visitors. This thus suggests that 44% of the display sessions were idle, having no visitors to the hosting website.

Table 1: Descriptive statistics of clickthrough rates, categorized by banner locations and banner animations

Variables		N	Average	Standard deviation
Animation:	Animating	2,441	0.008834	.00164
	Stay-still	2,387	0.006375	.00121
Location:	Top	2,437	0.004643	.00113
	Middle	2,437	0.010483	.00168
Total		4,828	0.007591	.07071

Table 2: Results of testing distribution of clickthrough rates

Conditions		Kolmogorov-Smirnov Statistics	df	p-value
Animation:	Animating	.526	2441	.000
	Stay-still	.527	2387	.000
Location:	Top	.524	2391	.000
	Middle	.528	2437	.000

5. CONCLUSION AND DISCUSSION

A field experiment to examine the effect of animation and location on Internet banner's clickthrough rate took place for almost two months on one educational website in Thailand. The banner featured on the website's homepage was about the school sports facilities. This yields 4,828 records of data for the examination. In overall, the clickthrough rate is 0.7591%, indicating that at least one in 200 visitors to this website will click on these banners. This figure seems trivial; however, it is consistent with past research findings. Hong and colleagues [14] discovered based on their controlled experiment that the average clickthrough rate is about 13%. Similarly, Li and Bukovac [16] discovered a 29.5% rate of clickthroughs in their controlled experiment. However, Siegal and coworkers [34] confirmed the significantly less rate. It was 0.4%. Therefore, this current study's finding is still in line with more recently studies employing a field experiment approach. Given the low rate of clickthrough, this finding would empirically add that an increasing number of visitors have become "banner blindness" [3, 20] for these declining rates of clickthrough. Together with this study's finding that 44% of our experiment sessions had no visitors, this would call for a serious examination

on (1) online advertising campaigns that could increase traffic at a website and (2) design issues that could draw a visitor's attention so strongly that he could eventually click on the banners.

The difference of clickthrough rates between those on animating banners and those on stay-still banners is not significant. Although this contrasts to our expectation, it seems to confirm that animation may not be able to earn the high number of click as commonly expected or if it could attract visitors' attraction, the effect might be too weak to drive them to click. This result is however consistent to much of past research [13, 22, 28, 32]. Although the findings of past research, have informed us of the possibility that animation may no longer have the magic, we still believe the animation should be immensely visible in order to drive those visitors who notice the animation to eventually click on them. This is the reason that we opted to animate the banner, not its content. In other words, the animating banner may have led to the high rate of clickthrough; but we fail to verify it in this study. There are two possible explanations. Either is the animation extent still less visible or the animation has absolutely no effect on this clickthrough rate. This urgently calls for further investigation.

The difference between the clickthrough rates on banners placed on the top of a webpage and the

rates on those in the middle location is however statistically significant. According to Table 1, it seems that the banners in the middle location received a slightly higher rate of clickthrough. This may then add to a body of empirical knowledge that the middle location in a webpage appear to catch a visitors' eyes so well that it further leads to the high rate of clickthrough.

Theoretically, the study's findings have extended insights into online advertising in the context of Internet banner campaigns among Thai targets. Especially, it is empirically evident that banner location could lead to significantly different rates of clickthroughs. Practically, the findings offer at least three recommendations for online media practitioners. First, the trivial difference of clickthrough rates between animating and stay-still banners may give a hint not to incorporate animation into the banner design, particularly when the cost of integrating it is expensive. Based on this study's finding, even the banner itself is animating, it still leads to approximately the same rate of clickthrough as that on stay-still banners. The online marketers might want to consider other options, even the animation is always visually appealing. Second, practitioners should try to secure a webpage's middle location for horizontal banner placement since the clickthrough rate on such location is significantly different from that on the top location. Finally, the finding in which 44% of this study's sessions had no visitors may suggest that practitioners concentrate more on how to increase the visitors or the traffic to the website. It might be beyond this study's scope to offer any valid recommendations on this issue. Yet, this high percentage could warn practitioners to be attentive not only to the click but also to the visitors.

The utility of this study could have been more noticeable, if it had not had two limitations. First, this study is limited in scope since it involves one actual website. The findings are valid on this scope. Any generalization to other websites should be made with high precaution. Future work on different website categories or other scope may shed more light on this issue. Second, although the two months of the experiment were long enough to offer valid experimental findings, we must admit that the longer period may be able to take into account the temporal effect. Thus, other research fellows may be interested in replicating the similar project covering a longer period of time in order to arrive at a more complete picture.

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CONSUMER MANAGED HOME E-HEALTH FOR THE NEXT DECADE

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ABSTRACT

Connectivity allows access to health information services at home for self-care, on-line or automated consultations, links with home telecare devices for safety, independent living and social links.

The trends for access to healthcare from the consumers' own homes through intelligent assistive technology offers significant sustainability advantages including reduced admissions, readmissions, length of stay when people are admitted, reduced carer and patient travel, and other clinical, social and economic benefits.

This paper will discuss the opportunities for better delivery of care to the elderly in their own homes, the availability of innovative technology, evidence of benefits and pathways for greater adoption.

Keywords: e-Health, telecare, telehealth, assistive technology, consumer

INTRODUCTION

The needs and opportunities for better delivery of healthcare is indicated by the high level of poorly-managed illness, adverse events and conditions amongst the elderly in the community and in residential aged care. These include falls, polypharmacy, medication events, the incidence of aspects of frailty such as incontinence, cognitive decline and social isolation. Telecare in the form of the personal emergency alarm is readily available in many countries and there are many projects that are deploying home telehealth but not yet a sustainable market.

There are many chronic illnesses that could be better managed with innovative intelligent assistive technology technologies that are available, yet rarely found in the homes of people who might benefit most from their use. Intuitively, supporting people at home would incur a lower cost than hospital care. Whilst there are successful pilots and projects that have shown compelling evidence of benefits, there are other pilots that have been abandoned and the systematic reviews of the literature have been inconclusive.

There is much to be done in research to improve

access to intelligent assistive technologies for people who could benefit including frail aged consumers, their families, carers, care provider organizations and care funders. There is a need for more compelling evidence of the benefits through large-scale randomized controlled trials to be able to influence policy relating to resource allocation. There is a need for greater awareness of the technology and how to acquire and operate it successfully.

NEEDS AND OPPORTUNITIES

Age-related demographic changes in Australia and the rest of the world are well-documented [9]. Associated with ageing is an anticipated increase in demands for support and increasing incidence of chronic illnesses such as chronic obstructive pulmonary disease and heart failure [1]. Ageing increases the likelihood of such conditions and can expose consumers, their families and carers to well-known challenges of social isolation [5], depression, polypharmacy [6], medication errors [Runciman et al], reduced mobility and risk of falls [2]. Consumers and their families are ill-prepared to deal with issues that confront them suddenly following a serious fall. The experience of navigating the complexity of services to meet the needs of a family member can be daunting [3]. To date care delivered in the home has remained largely labour-intensive and poorly supported by modern technologies to help consumers or their families in accessing and sharing information, better managing conditions, restoring function and providing the best-possible quality of life.

Almost all areas of healthcare provision experience demands that exceed capacity. Assistive technology will assist in the better adoption of assistive technologies that will enable consumers to better manage their own care, access information and consultations from their own homes, reduce the need to travel, enhance safety, provide connections to others and provide many other benefits.

To date the consumer experience of assistive technology has not been fully understood as evidenced by the low level of adoption and the high level of abandonment. In Australia the Independent Living Centres provide a valuable service to consumers, families and carers through awareness-raising and promoting adoption. There is however little follow-up research on the

experiences of consumers who have received a consultation on assistive technologies or who may have acquired these. There is a need to understand their experiences, attitudes, perceptions, benefits and barriers. This would help to better deploy assistive technologies to reduce the pressures on the healthcare workforce and many other benefits.

Falls

Falls amongst the elderly can have catastrophic consequences with only fifty per cent of people who suffer hip fractures ever regaining the ability to walk without the use of mobility aids. Falls are defined as “an unintentional descent to the floor or ground in a conscious patient” [4]. Falls account for the largest proportion of all injury related deaths and hospitalisations in individuals over 65 years [10] and one third of older Australians will fall each year with the risk increasing with age. For individuals over the age of 80 the risk of falls is double due to the prevalence of multiple risk factors associated with age [11]. In residential aged care up to 50% of older people fall once or more in a year. There is an abundance of literature on risk factors associated with falls. Falling is not a diagnosis but a symptom of multiple underlying diseases, the effects of medications, and/or environmental hazards or obstacles. Strategies for falls minimisation include screening, use of assistive devices, education, exercise and addressing environmental hazards. Falls in older people are preventable, complex events that involve a number of interactive risk factors, and the more risk factors the greater the chance of falling.

Early identification of falls risk or falls related injury risk and development of a targeted management plan reduces the likelihood of development of secondary problems such as fear of falling and reduced activity level, and increases the likelihood that interventions will be successful. Falling is a health condition meeting all criteria for prevention: high frequency, evidence of preventability, and high burden of morbidity. The multifactorial nature of falls requires a coordinated approach involving care professionals such as the patient’s family doctor, community care nurses, allied health, medical specialists and others. This requires an integrated approach to care supported by communications and information management infrastructure.

There are movement detectors that can be installed in a home and which will alert for lack of movement that might indicate that a fall has happened. Other wearable technologies will detect that a fall has happened and that a carer needs to be alerted. Anecdotal evidence is that the elderly are reluctant to wear devices. There is work on intelligent assistive technologies are available that

can monitor movement and gait in order to predict the likelihood of a fall. These assess gait and balance and attempt to infer future risk. There is early work on devices that will record events surrounding a fall in order to identify factors leading to falls. In addition there are technologies that will automatically alert a carer in the event of a fall.

Cardiovascular disease

Cardiovascular disease including Heart Failure is Australia’s most costly disease and second only to cancer in terms of disability and premature death [1]. Heart disease is a major cause of hospital admission with readmission rates from an exacerbation of heart failure of 30% and 60% at 30-day and 12 months respectively following discharge. It is associated with high levels of health-service utilisation across all settings of care as the disease progresses. Risk factors such as smoking, lack of exercise, being overweight, excessive alcohol use and poor diet can be minimized, and thereby can greatly reduce the impact of heart disease [2]. There is evidence that cardiac rehabilitation can decrease these risk factors. This is the goal of the Heart Failure Service at the Royal Brisbane and Women’s Hospital, where objective evaluation of our model will be conducted.

Home-based healthcare support can assist with early intervention and help patients to proactively manage their conditions through self-monitoring, thereby reducing the need for patients to leave their homes to seek advice and care. Through on-line transmission of patient vital signs and other indicators, the technology can help prioritise home visits and decrease clinician visits for only routine check-ups. Having a personalised care plan with specific targets, supported by timely access to quality information sources and to healthcare professionals when required from within their homes, would enable many people with chronic health to take charge of their own care.

Home heart failure services are multi-disciplinary and depend on effective working relationships with members of many health disciplines, for example, General Practitioners, Allied Health Practitioners, Nurses, and Internal Medicine Specialists, with particular expertise in cardiac care and community and restorative care. There are few means of electronically sharing patient information across sectors and across the many carers that a patient interacts with. HF carers work in a field where there is a high level of adverse events, conditions and unmet needs. Many of their patients have multiple and complex co-morbidities. HF clinicians are often

isolated in their work and usually limited for time, information and resources. There is interest in but not as yet a favourable expectation of ICT (Information & Communications Technology) such as intelligent assistive technology for efficiency, effectiveness and productivity. The technology is expected to provide efficiencies which will help with the shortage of staff to work in this area.

INTELLIGENT ASSISTIVE TECHNOLOGIES

There is a need for more knowledge to assist in improving the processes of client consultation around assistive technologies and providing advice to clients and their families. The knowledge would assist in training of Allied Health professionals and relevant clinical schools. It would also be of interest to developers of assistive technologies, telecare and telehealth to assist them in product design, development and marketing.

Assistive technology deployment would support the healthcare reform agenda in Australian and in other countries which advocates for more care in primary and community settings, health literacy, consumer health education, self-care and greater use of technology. It will help shift the focus more to prevention and management of care in the community and better equipping consumers and their families to proactively manage conditions. It will identify a major knowledge gap which is the experience of consumers of assistive technology services. There is a need for more large-scale randomised survey of consumers of intelligent assistive technology services. The benefits of the intelligent assistive technology will help intelligent assistive technology providers improve their services to achieve a higher level of consumer adoption and realisation of the benefits for consumers and their families. A better understanding of the consumer experience and resulting strategies for adoption will give care providers greater comfort for investing in these innovations.

Such research will examine how AT can help people get access to health care, their perceptions of costs and benefits, what happens to patients as a result of receiving intelligent assistive technology consultations and their experiences with AT. It will assist the intelligent assistive technologies and other health services to identify the most effective ways to organize, manage, finance, and deliver high quality care; reduce errors; and improve patient safety through innovative home health technologies.

BARRIERS AND PATHWAYS TO ADOPTION

Intelligent assistive technologies such as telehealth have not been widely adopted despite the expected value in timely and cost-effective management [Hebert et al 2006]. Barriers to adoption include a low level of awareness, a lack of business models for providing and supporting the technologies, user resistance on the part of both consumers and carer professionals, a lack of funding for the technologies, healthcare and support services funding models which tend to focus on end-stage of disease and episodic treatment rather than long-term and chronic conditions, and many other factors. Where technologies have been initially adopted there has been a high level of abandonment reported.

One of the reasons for this recalcitrance is the lack of studies that have progressed beyond pilot scale; there is also criticism of the quality of the available evidence [13].

CONCLUSION

Health services are under increasing strain in most countries; this will intensify as Babyboomers move into old age when the incidence of illness and utilisation of health services increases. Currently almost one million Australians receive some form of support at home; usually delivered in labour-intensive modes and there is little adoption of home assistive technologies and telehealth beyond pilots. Some evidence is emerging that home Assistive Technologies can reduce admissions and re-admissions, reduce hospital length of stay, improve community nursing work-force productivity, reduce patient and carer travel, allow consumers to delay or avoid moves into nursing homes, enable patient self-care and produce better clinical outcomes. There has been little feedback on patient outcomes and experiences which will help in service planning and effectiveness. The outcome will help health services in resource allocation decisions, help technology developers in design approaches to achieve greater adoption, and will assist consumers live independently and better manage their own care.

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HEDONIC VALUES AND UTILITARIAN VALUES AS PREDICTORS OF SOCIAL MEDIA PARTICIPATION

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ABSTRACT

This research proposes a model to investigate the behavior of posting articles and the continued use of social media via Babin's value perspective. The antecedents of values are web quality and users' emotions. The model was tested with PLS-Graph software based on its structural equation modeling approach. Data was gained from 310 users. The results revealed that antecedents have a strong impact on user values, which in turn influences users' intention to post articles and continue to use social media. Several implications for research and practice have been derived from these findings.

Keywords: Hedonic Value, Utilitarian Value, Continued Use Intention, Intention to Post.

1. Introduction

The emergence of social media (e.g. blogs, forums, Facebook, Twitter, and YouTube) represents the new wave of web-based services [14]. Social Media is "a group of Internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of user generated content" [22]. According to the Pew Research Center, in 2009, 46% of American adults and 65% of American teenagers have used social media [26]. Nielsen [32] reported that social network and blogging sites now account for almost 10% of all Internet time, and two-thirds of the world's Internet population visit social networks or blog sites.

Social media is more interactive, customized, and social as these sites allow Internet users to contribute content by posting articles, participating in discussions or sharing pictures or videos. Consumers are no longer passive receivers of marketing messages; instead, they are using social media to voice their opinions [35]. Moreover, consumers seek products, services, and company information on social media sites created by experienced consumers, as these can be more credible than the information provided by marketers [9]. The benefit of social media for companies is a low-cost service which reaches large audiences [8]; for customers it provides instant access to a large number of different opinions and authors. As such, social media potentially provide a low-cost form of communications to aid marketing managers in strongly connecting their companies with customers.

Social media is a very powerful marketing tool; however, marketing managers may lack an understanding of what social media is. They may regularly ignore or mismanage opportunities and be reluctant to allocate

resources to engage social media effectively [23]. Moreover, several studies have focused mainly on the factors driving users to share information (e.g. [39]) and factors behind users' continued use of social media (e.g. [25]). These areas of inquiry are important and worthy of exploration; however, a significant question has been ignored: Could a comprehensive model explain the behavior of individuals in posting articles and their continued use of social media? A comprehensive model could help marketing managers better promote their brand and presence on social media. This study sets out to examine values [5] in order to propose a model that may provide a more comprehensive understanding of why users post articles and continue to use social media. From this perspective, values are seen as an important antecedent for investigating user behavior on social media sites [20].

This study adopts Babin et al.'s [5] value perspective to explore users post and their continued use of social media sites. Babin et al. [5] claimed that consumers acquire two types of values while shopping, namely hedonic values and utilitarian values. Babin has applied hedonic and utilitarian values in explaining users' shopping behavior in the retail area (e.g. [3]; [7]; [6]). The results of this research indicated that users receive both hedonic and utilitarian values from shopping, which in turn enhances their behavior. Moreover, Wang et al. [37] adopted a value perspective to investigate consumers' purchase intentions when accessing online stores. The results were also similar to the findings of Babin's study. According to Babin et al.'s [5] study, values are the user's evaluation of interactive experience. This study aimed to use the value perspective to investigate the behavior of individuals using interactive social media, in order to gain a better understanding of its theoretical and practical implications.

2. Conceptual Framework and Research Hypotheses

The objective of this study was to propose a value perspective model to explain how antecedents, such as web quality, pleasure and arousal influence users' values. In turn, this will predict user behavior, including the intention of users to post articles and to continue using social media. The model is shown as Figure 1.

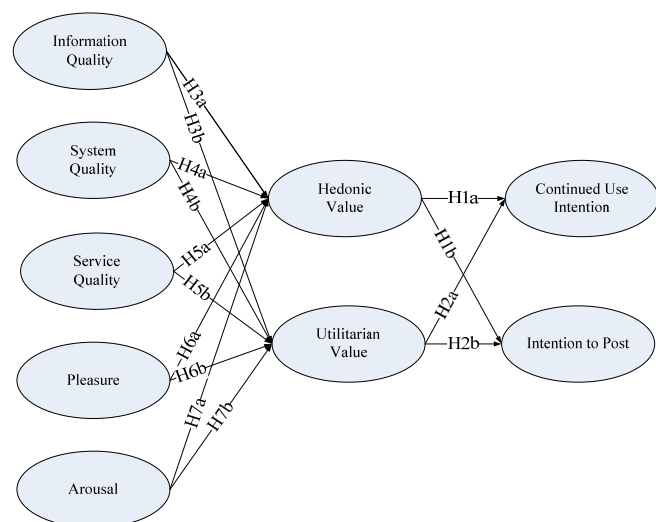


Figure 1. Research Model

2.1 Hedonic values and Utilitarian values

Traditional research usually explains consumers' purchasing or usage behavior as maximizing utilitarian value. However, a number of recent researchers have argued that value is more complex and does not only involve utilitarian values [18]. The functionalist perspective only emphasizes the product's function and ignores the emotions involved in making a purchase or using a product. Consequently, Hirschman & Holbrook [18] proposed the concept of hedonic consumption. They proposed that aside from pursuing the maximum utilitarian value, consumers purchase in order to satisfy their hedonic needs; the hedonists expect to gain pleasure from purchasing or using services [19].

Most researchers also divide customer values into two different categories: utilitarian and hedonic values (e.g. [18]; [5]). Utilitarian value is defined as the value that a customer receives from the functionality of the product purchased [5]. Hedonic value is defined as the value that a customer receives in terms of the subjective experience of fun and playfulness [18]; [5]). These two customer values provide an evaluation of a customer's interactive experience and highlight important outcome variables in the consumption process [5]. In addition, these values will influence consumers' decision-making regarding their future purchases.

Babin et al. [5] also pointed out that utilitarian and hedonic values are not mutually exclusive; consumers may not only receive hedonic values in shopping but they can also satisfy their specific purposes ([18]; [5]). Value is derived from users' evaluation of the interactive experience with an object or event or with the media or activity [11]. In other words, value is not only created and perceived by consumers as a result of the shopping process, but is also perceived in their use of social media. Moreover, some researchers have suggested that using web services may actually increase the values gained by users (e.g. [20]). Thus, it is reasonable to assume that continued use of social media and an intention to post future articles could be valuable outcomes of the use of social media by consumers.

According to Childers et al. [10], customers gain hedonic value when browsing the web; they may be

motivated to increase the amount of time they spend on a visit to a Web site and be encouraged to make repeat visits. Babin et al. [7] pointed out that customer values, both utilitarian and hedonic values, shape important consumption outcomes that ultimately determine marketing success. Mathwick et al. [30] found that Internet-based experiential value perceptions are positively associated with patronage intentions. Wang et al. [37] discussed consumers' willingness to make purchases from retail web sites and determined that when consumers have the flow experience, they will gain both hedonic and utilitarian values, which will lead to further intentions to patronize the site (flow is the mental state of operation in which a person in an activity is fully immersed in a feeling of energized focus, full involvement, and success in the process of an activity). Investigations by Jones [21] determined that when consumers get hedonic and utilitarian values from shopping, they might become loyal to a particular store. Similarly, Jin et al. [20] found that users like to participate in social media because they gain hedonic and utilitarian values in so doing. Therefore, we propose the following hypotheses:

H1a: Hedonic value has a positive influence on intention for continued use.

H1b: Hedonic value has a positive influence on intention to post.

H2a: Utilitarian value has a positive influence on intention for continued use.

H2b: Utilitarian value has a positive influence on intention to post.

2.2 Website quality

Previous research has shown that website quality is a critical and significant factor affecting the use of web services. For instance, Lin [28] showed that website quality is the key contributor to the use of social media sites. According to the Delone and McLean's IS success model [12], website quality has three major dimensions: system quality measures the functionality of the website, information quality measures the content of the website and service quality measures the overall support by the website. On social media sites, especially blogs, system quality means that blogs can satisfy the functionality of users' browsing and posting; information quality means that blogs can provide the content that users need; and service quality means that the blog platform can satisfy users' requests.

This study compares system quality, information quality, and service quality to website quality as the external variables for investigating the use of social media sites. Babin et al. [7] pointed out that high service quality might lead to higher hedonic and utilitarian value in the service domain. Moreover, Kim and Han [24] showed that the perceptions of quality significantly influence user values, which in turn may affect user behavior in adopting mobile services. Shamdasani et al. [33] showed that values may be an antecedent to a user's willingness to continue using web services and as an outcome of perception of quality. The related hypotheses are as follows:

H3a: Information quality has positive influence on hedonic value

- H3b: Information quality has positive influence on utilitarian value
 H4a: System quality has positive influence on hedonic value
 H4b: System quality has positive influence on utilitarian value
 H5a: Service quality has positive influence on hedonic value
 H5b: Service quality has positive influence on utilitarian value

2.3 Pleasure and arousal

The web environment is an important factor in facilitating web services because most consumers evaluate the web environment before performing web services [34]. Previous studies have suggested that emotions evoked by environmental characteristics are fundamental in explaining consumer-environment interactions [36]. Babain and Attaway [3] also showed that increased positive effects lead to acquisition of higher hedonic and utilitarian values, which in turn influence user behavior.

Mehrabian & Russell [31] proposed an environmental psychology concept, which suggested that people will experience certain emotions as the result of environment stimuli such as color, temperature, smell or sound. The researcher also suggests that a person's emotional state while receiving an environmental stimulus might be expressed in terms of three basic dimensions. Pleasure is a positive emotional state of feeling: happy, pleased, satisfied, contented, hopeful and relaxed. Arousal is a positive emotional reception in response to personal awareness, motility and alertness. Dominance is a positive emotional response when a person acquires domination or power: he or she may be in-control, influenced, important, autonomous and dominant.

Babin et al. [5] adjusted the P-A-D (Pleasure-Arousal-Dominance) dimensions proposed by Mehrabian & Russell [31] to investigate the emotional responses exhibited by consumers in shopping scenarios. The finding was that pleasure and arousal will enhance consumers' acquisition of hedonic and utilitarian values. Similarly, Babin and Daren [4] applied P-A-D dimensions to investigate the relationship between customers' emotions and consumers' evaluations of the shopping experience (hedonic and utilitarian values). The results showed that both pleasure and arousal relate positively to the acquisition of hedonic and utilitarian values, but dominance has no influence on hedonic and utilitarian values. Moreover, Wang et al. [37] showed that pleasure and arousal are significant contributors to hedonic and utilitarian values when customers using on-line stores. The related hypotheses are as follows,

- H6a: Pleasure has positive influence on hedonic value.
 H6b: Pleasure has positive influence on utilitarian value.
 H7a: Arousal has positive influence on hedonic value.
 H7b: Arousal has positive influence on utilitarian value.

3. Research Methods

3.1. Questionnaire Development

Below, the questionnaire used for assessing user behavior of social media is described. The measures of our framework were adapted from the validated measures of prior studies from the literature to suit the context of our study. The respondents assessed all items via a seven-point Likert scale ranging from 1 = "strongly disagree" to 7 = "strongly agree." The measures are listed in full in Appendix A and the descriptive statistics of the individual scales are shown in Table 1.

Web quality includes: information quality, system quality and service quality, which were measured with four items respectively adapted from Ahn et al. [1] and Lin [28]. Pleasure and arousal addressed the notion that users' experience emotion when using blogs. The abovementioned three items were adapted from Babin and Darden [4]. Customer values were divided into hedonic and utilitarian values to predict the behavioral intentions of using blog. Hedonic and utilitarian values were measured with four items, respectively and adapted from Babin et al. [6]. To assess the consequences of blog use, intentions for continued use and intention to post, each contained three items. The goal of continued use intention was to address that users want to continuously use blogs in the future. The items were adapted from Lin [28] and Li et al. [27]. Intention to post assessed what people release on blogs in the form of ideas or articles. The items were adapted from Wu and Tsang [38].

3.2 Sample and Data Collection

Blogs on the EC website, FashionGuide, allow all members to access and share information in a variety of posts or arguments about a particular topic to do with cosmetics. The blog service on the EC website introduces substantial and pervasive changes to communications among companies, bloggers and individuals. Social media presents an enormous challenge for companies. For example, the company can not passively wait for customers' comments; instead, customers want companies to actively engage, listen and respond appropriately.

This study explores the influence of continued use intention and intention to post on users' behavior. To test the model and address the above hypotheses, this study conducted an online survey on a cosmetic EC website with blog services. We posted a message on the websites asking respondents to complete an online questionnaire. A total of 323 surveys were received, but 13 surveys containing incomplete data were eliminated. The remaining 310 questionnaires represent a useable response rate of 96%.

Table 1. Sample profile.

Item	Demographics	Percentage
Gender	Male	13.5
	Female	86.5
Age	From 18 to 25 years old	51.9
	From 26 to 35 years old	42.6
	Above 36 years old	5.5
Education	High school degree and below	6.8
	College/University	77.4
	Master's degree and	15.8

	above	
Occupation	Student	34.8
	Service and Financial industry	21.6
	Public service	5.8
	Information technology industry	5.5
	Manufacturing industry	7.4
	Other	24.8
Experience of using blogs	Under 6 month	21.6
	6 month-1 year	15.5
	1-3 years	34.5
	Above 3 years	28.4
Frequency of using blogs (per week)	Under 1 time	14.2
	1-2 times	22.3
	3-6 times	26.5
	Above 7 times	37.1

4. Data Analysis and Results

Partial Least Squares (PLS) Graph Version 3.00 Build 1130 was used to conduct measurement validation and model testing. In the following, the models were tested with a two-stage structural equation model by Anderson and Gerbing [2] and Hair et al. [17]. First, the measurement model was used to assess the item reliability, construct reliability and two types of validity: convergent and discriminant validity. Secondly, a structural equation model

analysis was used to test the research hypotheses empirically.

4.1 Measurement Model

Item reliability, construct reliability and the two types of validity (i.e., convergent and discriminant validity) were taken into consideration in assessing the quality of the measurement model. As suggested by Hair et al. [17], an item loading greater than 0.5 can be considered acceptable. As shown in Appendix A, all of the item loadings exceed the minimum required value. In order to evaluate the construct reliability, we assessed the composite reliabilities (CR) of each of all constructs. The composite reliability values ranged from 0.88 to 0.96, which exceeded the 0.7 reliability criteria (shown as Table 2). We assessed the convergent validity by examining the average variance extracted (AVE), since each construct had an AVE of at least 0.5 [16]. The average variances extracted (AVE) from all nine constructs ranged from at least 0.65 to at most 0.88, all exceeding the critical value. Finally, we verified the discriminant validity by examining the value of the square root of the AVE to determine whether or not it was consistently greater than the off-diagonal correlations [16]. The results presented in Table 2 demonstrate satisfactory discriminant validity, which means that all of the constructs differ from each other. Overall, all multi-item constructs demonstrate high internal consistency and convergent and discriminant validity.

Table 2. Reliability and Validity

	Item	CR	AVE	IQ	SQ	SerQ	Pleasure	Arousal	HV	UV	CUI	IP
IQ	4	0.88	0.65	0.81								
SQ	4	0.89	0.67	0.62	0.82							
SerQ	4	0.94	0.81	0.69	0.62	0.90						
Pleasure	3	0.95	0.87	0.63	0.68	0.64	0.93					
Arousal	3	0.94	0.83	0.50	0.44	0.50	0.61	0.91				
HV	4	0.91	0.72	0.53	0.55	0.52	0.68	0.55	0.85			
UV	4	0.90	0.80	0.67	0.65	0.65	0.67	0.56	0.61	0.89		
CUI	3	0.92	0.78	0.63	0.62	0.57	0.68	0.52	0.72	0.64	0.88	
IP	3	0.96	0.88	0.43	0.42	0.43	0.45	0.38	0.52	0.43	0.61	0.94

Note. ^aDiagonal elements in the "correlation of constructs" matrix are the square root of the average variance extracted. CR is "Composite Reliability"; AVE is "Average Variance Extracted"; IQ is "Information Quality"; SQ is "System Quality"; SerQ is "Service Quality"; HV is "Hedonic Value"; UV is "Utilitarian Value"; CUI is "Continued Use Intention"; IP is "Intention to Post".

4.2 Structural Model

The structural model is mainly used for testing the hypothesized relationships. We tested the research model with a bootstrapping procedure to acquire the path estimates and t-value, which were used to test the hypotheses. The results of the structural model test are shown in Table 3.

The results partially support Hypothesis Sets 1 and 2. The results show that hypotheses were supported and indicate that hedonic values have a strong and significant impact on user behavior, which can lead to greater intention for a user's continued use of the social media and posting of ideas. The effects of the information, system and system

quality on hedonic values were not supported, but these factors were significant in the perception of utilitarian value. Finally, as predicted by Hypothesis Sets 6 and 7, the effect of pleasure and arousal influenced users' hedonic and utilitarian values.

The R² values of the endogenous constructs can be explained with the explanatory power of the proposed model. The explained variance is 58% for continued use intention, 29% for intention to share ideas, 51% for hedonic value and 61% for utilitarian value. All of the R² values exceed the minimum criteria of 0.10 [15].

Table 3. Tests of Hypothesized Relationships

Table 3: Tests of Hypothesized Relationships					
Structural Path		Standardized Coefficient		t-value	Hypothesis
Hedonic Value	→	Continued Use Intention	0.52*	11.00	H1a (supported)
Hedonic Value	→	Intention to Post	0.41*	7.81	H1b (supported)
Utilitarian Value	→	Continued Use Intention	0.32*	6.87	H2a (supported)
Utilitarian Value	→	Intention to Post	0.17*	2.58	H2b (supported)
Information Quality	→	Hedonic Value	0.07	1.19	H3a (non-supported)
Information Quality	→	Utilitarian Value	0.23*	3.88	H3b (supported)
System Quality	→	Hedonic Value	0.12	1.72	H4a (non-supported)
System Quality	→	Utilitarian Value	0.22*	3.49	H4b (supported)
Service Quality	→	Hedonic Value	0.03	0.36	H5a (non-supported)
Service Quality	→	Utilitarian Value	0.17*	3.06	H5b (supported)
Pleasure	→	Hedonic Value	0.43*	6.25	H6a (supported)
Pleasure	→	Utilitarian Value	0.17*	2.93	H6b (supported)
Arousal	→	Hedonic Value	0.19*	3.36	H7a (supported)
Arousal	→	Utilitarian Value	0.17*	2.98	H7b (supported)

Note. * $p < 0.05$; R^2 of Hedonic Value = 0.51; R^2 of Utilitarian Value = 0.61; R^2 of Continued Use Intention = 0.58; R^2 of Intention to Post = 0.29.

5. Discussion and Conclusion

The aim of this study was to adopt a value perspective in order to investigate user behavior related to posting articles and continued use of social media. Specifically, this study adopted website quality, pleasure and arousal as external variables; the results indicate that these external variables could influence users' values in using social media (hedonic value and utilitarian value).

5.1 Theoretical Contributions

The findings of this study have important theoretical implications for social media use. First, this study applied Babin's value perspective to explain two important behaviors of social media: continued use intention and intention to post articles. The results showed that hedonic value and utilitarian value are significant predictors of behavioral intention to share content and to continue using social media. The results are similar to the results of previous research (e.g., [37]; [5]; [3]). In addition, the explanatory power of endogenous constructs in a research model is high; therefore, Babin's shopping value not only applies to purchase behavior, but also to the behaviors of browsing, posting and general use of social media. Returning to the original research question, this study can definitively state that there are positive correlations between user values and participation in the use of social media.

Second, information quality, system quality and service quality are shown to be significant influences on utilitarian value but do not appear to significantly influence acquisition of hedonic value. Therefore, enhancing web quality was an important factor in terms of utilitarian value, but not hedonic value. Whereas the goal of using social media is to exchange information, or solve specific problems [13], hedonic value is gained when using a social media site for fun, fantasy or relaxing [13]. This study showed that the provider of a social media site should offer good system and service support to increase user value and participation in the social media site.

Third, pleasure and arousal are significant influences in increasing both the utilitarian value and hedonic value of a social media site. Results also show that pleasure and

arousal have a greater influence on the acquisition of hedonic value than they do on utilitarian value. This result is similar to previous research findings which showed that users not only focus on the process, but also on achieving a task when using web services [37]; as a result, pleasure and arousal have more influence on hedonic value.

5.2 Contributions to Management Practice

The goal of this study was to use the results achieved to explain how marketing managers might use social media to promote their companies and improve business/ consumer relationships. To attract user participation in social media, marketing managers need to focus their attention on satisfying users' hedonic and utilitarian values. They should also choose a stable and user-friendly platform on which to release their product or service information. In addition, famous bloggers might be employed to post high-quality information about a company's product or service. The information provided in the social media must be complete, current or customized to the users of the site. Finally, marketing managers should carefully plan and design social media because it can evoke high levels of pleasure and arousal in users and is apt to increase user values.

5.3. Research limitations and future development

Limitations to this study include the fact that we examined only one social media site. This study would not be able to generalize these findings in reference to other kinds of social media. Future research could explore the use of other forms of social media. Second, respondents may have misreported behavioral information, as we used self-reported rather than direct measures of social media use. To address the concern, future research should approach social media use via multiple methodologies. Collecting longitudinal data over a series of years should be considered as a necessary step. Finally, there are different factors influencing user values and behavior. Users may have privacy concerns while using social media [29] and may fear that their personal profile could be delivered randomly over the Internet. As a result, in the future, researchers could investigate the effect of perceived privacy risks and the

effect of privacy concerns on a user's behavior.

5.4. Conclusion

Social media is a unique phenomenon in that a user's identity is explicit, and social relationships are built upon computer-mediated interactions. This study adopted the value perspective proposed by Babin et al. [5] to verify that users would receive participative value from using social media. The participative value means that members acquire hedonic and utilitarian value by using social media sites. Our findings suggest that user values derived from their past experiences and interactions with social media may exert lasting participation behavior. The results also indicate that hedonic and utilitarian values can impact the intention of an individual to post and continue using social media sites. Moreover, research indicates the key mediating role of user values in creating user posting articles and their continued use of social media. Although, the information, system and service quality are not significant influences on attaining hedonic value, these factors still have an impact on a user's utilitarian values. As a result, a user's goal in using media sites is to get specific expected results. Finally, user emotions gained from using social media are a significant influence on the acquisition of both hedonic and utilitarian values. The results show that 'enhanced user emotions' is one of the important antecedents for creating a successful social media site. The results are potentially useful to both marketing managers and researchers.

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Appendix A. Measurement Variables

Variables	Measurement	Loading
Information Quality (CR=0.88 ; AVE=0.65)		
Blogs provide correct information.		0.86**
Blogs provide complete information.		0.77**
Blogs provide newest information.		0.70**
Blogs have fruitful content and provide all the information I need.		0.87**
System Quality (CR=0.89 ; AVE=0.67)		
The blog platform has a quick response function.		0.78**
The blog platform can satisfy my request.		0.84**
When I want to browse blogs, it works.		0.81**
The function of the blog platform is easy to use and browse conveniently.		0.84**
Service Quality (CR=0.94 ; AVE=0.81)		
The blog platform has quick service.		0.86**
The blog platform is willing to support users.		0.91**
The blog platform emphasizes my need.		0.90**
The blog platform is equipped with professional and functional images.		0.91**
Pleasure (CR=0.95 ; AVE=0.87)		
When I browse blogs, I feel happy.		0.95**

When I browse blogs, I feel relaxed.	0.91**
When I browse blogs, I am satisfied.	0.93**
Arousal (CR=0.94 ; AVE=0.83)	
When I browse blogs, I am aroused.	0.94**
When I browse blogs, I am excited.	0.91**
When I browse blogs, it can stimulate me.	0.88**
Hedonic Value (CR=0.91 ; AVE=0.72)	
I think it's interesting to browse blogs.	0.84**
Browsing blogs is more joyful than other things I do.	0.87**
I am immersed in exciting issues.	0.88**
When I browse blogs, I can forget the annoying things	0.78**
Utilitarian Value (CR=0.90 ; AVE=0.70)	
During browsing blogs, I finished doing the things I wanted to.	0.77**
I was satisfied because I didn't need to go other websites to get information.	0.88**
I think that the information and service provided by blogs is professional.	0.81**
Getting information from blogs is simple.	0.88**
Intention to continue (CR=0.92 ; AVE=0.78)	
I plan to browse blogs in the future.	0.88**
I want to browse blogs continuously.	0.87**
I want to extend my time browsing blogs.	0.86**
Intention to post (CR=0.96 ; AVE=0.88)	
I'm willing to frequently share the ideas and experience on my blog.	0.95**
I'm willing to release articles on my blog.	0.95**
I'm willing to share ideas when the users of website ask for my help and opinions.	0.91**

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AN EMPIRICAL ANALYSIS OF SNS USERS AND THEIR PRIVACY AND SECURITY AWARENESS OF RISKS ASSOCIATED WITH SHARING SNS PROFILES (ONLINE IDENTITIES)

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ABSTRACT

Social networking sites (SNS) like MySpace, Facebook and LinkedIn now have hundreds of millions of users. In this paper a quantitative approach was used to analyse primary data collected about SNS users. Our findings show that SNS users are dominated by younger adults, higher education levels and higher income levels. SNSs are more likely to be used for maintaining existing friendships as opposed to establishing new friendships and for building business networks. SNS users either have poor levels of privacy and security awareness or high levels of complacency in relation to SNS profile sharing and sharing their identity online.

Keywords: social network sites, privacy, social media, online identity

INTRODUCTION

Social networking is a phenomenon that has gained the attention of the general public, businesses and governments alike. The growth of social network sites like MySpace, Facebook and LinkedIn in a very short period of time has exceeded all expectations. Facebook, for instance, reputedly claimed to have more than 750 million users [15] which if true would make it the third largest country in the world. Application domains of Social Networking sites have extended from government, business, social, political, educational applications and beyond. However despite the exponential growth of social networking sites, there is a lack of empirical research which has endeavoured to understand the behaviours of social networking site users and the differences between the prominent social networking sites. This research investigates social networking site user characteristics and behaviours in relation to privacy of social networking users' identities by analysing empirical survey data collected on over 300 social networking site users.

We first review current literature in relation to SNSs with particular emphasis on understanding history and evolution of SNSs and how in particular privacy and security has become a concern. Next we present the research questions and describe methodology used in this research to collect data to answer these research questions. Then we present the results of our data analysis and discuss the key findings in relation to our research questions and frame a set of propositions for investigation in future work. We conclude by summarising our findings and their implications for research and practice.

LITERATURE REVIEW

In this section we review the existing literature that underpins this paper's three main research questions: RQ1: What are key demographic characteristics of SNS users? RQ2: What are

the main ways that SNSs are used by SNS users? Are they used differently in different types of SNSs? RQ3: What is the level of privacy and security awareness that SNS users have in relation to sharing their SNS profile and online identity in SNSs?

We begin with a short definition of social network sites (SNS). We then provide a brief history of the evolution and growth of SNSs followed by usage of SNS and some key privacy issues associated with SNSs.

Definition of SNS

Early virtual communities some of which started before the Internet were largely characterised as public discussion forums and structured by discussion topics or interests in a particular region, whereas social network sites (SNSs) are structured by "interactions among people" [14]. Given that SNSs enable people connections, it is not surprising that they have become deeply embedded in peoples' lives today [2].

For this research we adopt the definition of Boyd & Ellison who define Social Network Sites (SNS) as web-based services where users construct a public or semi-public profile, communicate with other users with whom they share a connection, and view and navigate their connections all within a system [2]. However, it should be noted that the terminologies used in these connections and system vary in different SNSs. Other distinguishing factors in SNSs include the culture it represents, its user-base (general vs shared-identity categories like country or language) or extent of features incorporated (mobile, blogging, instant messaging, video/ photo sharing and apps to name a few) [2].

Short history of the evolution and growth of SNS

As of this writing, there is a wide spectrum of active SNSs supporting a wide range of interests and features using different social networking models.

Table 1 shows some of the most popular SNSs that are active and has large number of registered users with an exception of *Six Degrees* which is the first SNS & not active but it is mentioned to provide the historical context into how SNSs began and the key SNSs that have emerged over time.

Year Started	Social Network Sites
1997	Six Degrees (First, Not Active)
1998	
1999	
2000	Habbo (for Teens)
2001	Meetup.com
2002	Friendster, MyLife
2003	Tribe.net, LinkedIn, MySpace, hi5
2004	Orkut, Facebook, Flickr, Tagged
2005	YouTube, Bebo, Qzone (Chinese), Renren (Chinese), Ning
2006	Twitter, V Kontakte (Russian), Badoo
2007	
2008	
2009	Sina Weibo (Chinese)
2010	
2011	Google Plus+

Table 1. Summary Table of major SNSs with their launch dates

Six Degrees was the first SNS that fits in our definition of a SNS but the service was closed in 2000 after being incapable of generating enough revenue [14]. Many online communities transformed themselves and re-emerged as SNSs over the next few years [2].

Friendster became very popular since its launch in 2002 but soon fell apart in the US due to technical, social and trust issues [1] but continues to be popular in Southeast Asia [10]. *Orkut* is another SNS similar to *Friendster* where the US user base diminished but it continues to be popular in Brazil and India [14].

Other SNSs evolved around some specific features they provide. *LinkedIn* is the most popular SNSs for business and professional networking [14] and has recently surpassed *MySpace* to become number two social network behind *Facebook* in the US [17]. Likewise, *Youtube* features videos & video sharing; and *Twitter* features microblogging posts (called “tweets”) and differentiate themselves with their special attributes and are popular SNSs due to the distinct services they provide.

Some of the most popular SNSs evolved from other forms of virtual communities. For instance, *Facebook* was initially designed to support a very specific demographic (college networks) before expanding to support broad audience [2] and has now become the world’s most popular SNS [6, p.13] with membership grown to over 750 million [15].

Outside the US, there are limited dialogue and research activities around SNS growth and understandings largely because of linguistic barriers to analyse other popular SNSs that originated from other countries: mainly *QZone*, *Renren*, *Sina Weibo* (China) and *Vkontakte* (Russia). Likewise, a general assumption about other western countries regarding SNS usage tends to follow the US phenomena although there may be some distinct differences which is beyond the scope of our study.

The picture of SNS growth is still evolving with new ideas to expand user base using the benefits of the network effect and engage its users into innovative and interesting activities providing specialising services. For instance, *Google Plus+* is the recent addition in the SNS arena which is trying to challenge dominance of *Facebook* and provide one significant point of differentiation: sharing with groups [11].

Usage of SNS

The total number of social network sites users is growing rapidly and has nearly doubled in size since 2008 [6, p.3]. It is not just the number of users but the popularity of SNSs also demonstrates stickiness and addictive appeal across different cultures and generations. TNS 2008 survey suggests that adults from 16 industrialised countries on average spend one-third of their leisure time online, have at least two SNSs and keep regular contact with 16 people who they have “virtually” met on the Internet [16].

Broadly speaking, contrary to the technical possibility that users of a SNS can use its social network to explore and find strangers to make friends, most SNS users prefer to maintain and enhance their already existing offline social relations using SNSs [2][3][9]. Lampe, Ellison, & Steinfield (2006) found that Facebook users engage in “searching” people with existing offline connections more than looking for complete strangers to meet [9].

Kumar, Novak, & Tomkins (2006) suggested that there are three major categories of SNS users: “passive members” who do not have any friend connection, “inviters” who encourage offline users to migrate online, and “linkers who fully participate in the social evolution of the network” [8].

Privacy Issues in SNS

A critical element of a SNS that contributes to the growth of the network connection is its open public display [2]. Paradoxically, SNSs are also subject to privacy concerns due to this very feature and potential privacy threats are one of the key research areas in SNSs.

In general, privacy is governed by an individual’s ability to manage social contexts. In the context of SNSs, privacy issues are bound by the needs of privacy in the underlying social connections [13]. SNSs tackle privacy issues through profile visibility options or privacy settings where SNS users can specify their preferences [2]. However, these settings do not easily assist users to specify varying levels of privacy settings to each of their friends for handling different conceptions of privacy, for example while handling conflict with friends [13].

There are a lot of studies describing privacy concerns on SNSs. Gross & Acquisti (2005) argues that students’ personal information on their Facebook profiles could be used to potentially construct users’ social security numbers [5]. A “phishing” scheme used in a 2007 study to send messages that appeared to come from a friend on the network of users that had public profiles suggested that these users are vulnerable to give away information to this fake “friend” – this suggests serious privacy leakage and security issues exist within SNSs

[7].

One recent critical review of Facebook in terms of its privacy issues is presented by Fuchs (2011) [4]. Fuchs argues that “Facebook commodifies and trades user data and user behaviour data” and suggests “sharing” on Facebook in economic terms means giving away information to advertising clients which raises grave concerns on privacy. A number of strategies to tackle these privacy issues are suggested: provision of opt-in online advertising, strict civil surveillance of Internet companies, and advancements of alternative social networking platforms that respects total privacy [4].

This literature review is not thorough due to space limitations, does not focus much on languages other than English used in SNSs and since it is a constantly evolving field, new breakthroughs and ventures providing refreshing arguments in the SNS usage landscape appear frequently.

Research questions

The literature reviewed regarding the characteristics and usage patterns of SNS users and their security and privacy awareness, leads us to investigate the following research questions:

RQ1: What are key demographic characteristics of SNS users?

RQ2: What are the main ways that SNSs are used by SNS users? Are they used differently in different types of SNSs?

RQ3: What is level of privacy and security awareness of SNS users in relation to sharing their SNS profile and online identity in SNSs?

METHODOLOGY

A quantitative positive approach was used in this research to analyse survey data collected for Pew Research's May 2008 cloud computing and adult social networking report which was released in January 2009 [12]. This survey data included 326 respondents from adults (18 years and older) who are using social networking sites. This data was collected in a rigorous manner and provides a large data set and comprehensive snapshot of the behaviours of SNS users at a recent point of time. These responses were analysed using descriptive statistics techniques such frequency tables, cross tabulations and ANOVAs to provide answers to the research questions posed in this research.

DISCUSSION OF RESULTS OF DATA ANALYSIS

Demographics of the SNS users that responded to the Pew Research survey are presented next with some descriptive statistics. After that, we observed some behavioural aspects of SNS users to understand different ways SNS sites were used and how usage vary based on SNS types; and then finally, we analysed SNS users awareness of their privacy leaks and resulting action of modifying SNS privacy settings to avoid such leaks.

SNS users demographic information

Usage of SNSs by gender was evenly split in the survey responses. Table 2 show the distribution of Internet Experience in years across SNS users.

	Frequency	Valid Percent	Cumulative Percent
Missing	3	.9	.9
1-5yrs	53	16.4	17.3
6-10 yrs	153	47.4	64.7
11-15 yrs	81	25.1	89.8
16-20 yrs	22	6.8	96.6
21-25 yrs	6	1.9	98.5
26-30 yrs	5	1.5	100.0
Total	323	100.0	
Missing	3		
Total	326		

Table 2. Internet Experience of SNS users

In regards to their Internet experience, about half of SNS users have significant Internet experience of 6-10 years and almost a quarter of SNS users had up to 15 years of Internet experience. This suggests more than 80% of SNS users had used Internet for over 5 years, suggesting SNS users are very Internet-savvy.

Table 3 presents SNS users in terms of their income levels.

	Frequency	Valid Percent	Cumulative Percent
Less than \$10,000	21	7.6	7.6
\$10,000 to under \$20,000	24	8.7	16.3
\$20,000 to under \$30,000	31	11.2	27.5
\$30,000 to under \$40,000	33	12.0	39.5
\$40,000 to under \$50,000	30	10.9	50.4
\$50,000 to under \$75,000	34	12.3	62.7
\$75,000 to under \$100,000	48	17.4	80.1
\$100,000 or more	55	19.9	100.0
Total	276	100.0	
Missing	50		
Total	326		

Table 3. Income Level of SNS users

The use of SNSs is dominated by the higher income groups with over 35 percent of respondents falling into the \$75,000 or higher income categories.

Similarly Table 4 shows that SNS users are highly represented by higher education levels (college education and higher) in the survey responses.

	Frequency	Valid Percent	Cumulative Percent
Less than High School	31	9.6	9.6
High School Graduate	74	22.9	32.5
Some College	105	32.5	65.0
College +	113	35.0	100.0
Total	323	100.0	
Missing	3		
Total	326		

Table 4. Education Level of SNS users

Two thirds of SNS users have higher education level as illustrated in Table 4. An ANOVA of frequency of SNS usage by education levels revealed there are significant

differences across different educational categories. A Post Hoc Tukey Test determined that SNS users with college or higher education were significantly different in numbers to the other three educational groups. Tables 5 and 6 present the ANOVA and Post Hoc Tests results.

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	47.851	3	15.950	8.900	.000
Within Groups	557.336	311	1.792		
Total	605.187	314			

Table 5. ANOVA – Frequency of SNS visits by Education

Multiple Comparisons							
Dependent Variable: Frequency of SNS visits							
	(I) Receduc	(J) Receduc	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	LT HS	HS Grad	-.015	.289	1.000	-.76	.73
		Some College	-.354	.274	.568	-1.06	.35
		College +	-.949	.272	.003	-1.65	-.25
	HS Grad	LT HS	.015	.289	1.000	-.73	.76
		Some College	-.339	.207	.359	-.87	.20
		College +	-.934	.205	.000	-1.46	-.41
	Some College	LT HS	.354	.274	.568	-.35	1.06
		HS Grad	.339	.207	.359	-.20	.87
		College +	-.595	.183	.007	-1.07	-.12
	College +	LT HS	.949	.272	.003	.25	1.65
		HS Grad	.934	.205	.000	.41	1.46
		Some College	.595	.183	.007	.12	1.07

Table 6. Post Hoc Tukey Tests - SNS visits by Education

SNS users are largely represented by younger generation with over 75% users under the age of 44 and more than half of them under the age of 35 years. Frequency table of SNS users by age (Table 7) reveals that 18-24 years group have the highest representation of SNS users amongst the survey respondents.

	Frequency	Valid Percent	Cumulative Percent
18-24	94	29.3	29.3
25-34	80	24.9	54.2
35-44	68	21.2	75.4
45-54	47	14.6	90.0
55-64	23	7.2	97.2
65 and over	9	2.8	100.0
Total	321	100.0	
Missing	5		
Total	326		

Table 7. Age groups of SNS users

An ANOVA of frequency of SNS usage by Age categories revealed there are significant differences across age categories. A Post Hoc Tukey Test determined that SNS users in the Age category 18-24 yrs were significantly different in numbers to the other four age groups other than 65 yrs and over age group. Tables 8 and 9 present the ANOVA and Post Hoc Tests results.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	101.205	5	20.241	12.391	.000
Within Groups	501.485	307	1.634		
Total	602.690	312			

Table 8. ANOVA – Frequency of SNS visits by Age

Multiple Comparisons							
Dependent Variable: Frequency of SNS visits							
	(I) recage	(J) recage	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	18-24	25-34	-.993*	.196	.000	-1.55	-.43
		35-44	-1.277*	.203	.000	-1.86	-.69
		45-54	-1.504*	.232	.000	-2.17	-.84
		55-64	-.960*	.315	.030	-1.86	-.06
		65 and over	-.785	.471	.555	-2.13	.57
	25-34	18-24	.993	.196	.000	.43	1.55
		35-44	-.284	.212	.762	-.89	.32
		45-54	-.511	.239	.271	-1.20	.18
		55-64	.033	.320	1.000	-.89	.95
		65 and over	.208	.474	.998	-1.15	1.57
	35-44	18-24	1.277	.203	.000	.69	1.86
		25-34	.284	.212	.762	-.32	.89
		45-54	-.227	.246	.940	-.93	.48
		55-64	.318	.325	.925	-.61	1.25
		65 and over	.493	.478	.907	-.88	1.86
	45-54	18-24	1.504	.232	.000	.84	2.17
		25-34	.511	.239	.271	-.18	1.20
		35-44	.227	.246	.940	-.48	.93
		55-64	.544	.343	.609	-.44	1.53
		65 and over	.719	.490	.686	-.69	2.13
	55-64	18-24	.960	.315	.030	.06	1.86
		25-34	-.033	.320	1.000	-.95	.89
		35-44	-.318	.325	.925	-1.25	.61
		45-54	-.544	.343	.609	-1.53	.44
		65 and over	.175	.535	.999	-1.36	1.71
	65 and over	18-24	.785	.471	.555	-.57	2.13
		25-34	-.208	.474	.998	-1.57	1.15
		35-44	-.493	.478	.907	-1.86	.88
		45-54	-.719	.490	.686	-2.13	.69
		55-64	-.175	.535	.999	-1.71	1.36

Table 9. Post Hoc Tukey Tests – SNS visits by Age

The age group 18-24 have the highest representation in SNS users. The results of the ANOVA and a Post Hoc Tukey test in Tables 8 and 9 show that this age group are significantly different from all the other age groups except for the 65 and over who are anyway under-presented in the survey responses.

Major purposes of using SNSs

After providing insights and understanding of the demographics of SNS users, we analysed some behavioural observations of SNS users to attempt to understand how they are using SNS sites (See Table 10) as and if users had multiple profiles in different SNSs, how did they use them for different purposes?

		Responses		Percent of Cases
		N	Percent	
SNS Main Uses	Make new friends	156	15.8%	50.5%
	Stay in touch with friends	281	28.4%	90.9%
	Flirt with someone	64	6.5%	20.7%
	Make plans with your friends	176	17.8%	57.0%
	Make new business or professional contacts	92	9.3%	29.8%
	Promote yourself or your work	89	9.0%	28.8%
	Organize with other people for an event, issue or cause	131	13.2%	42.4%
Total		989	100.0%	320.1%

Table 10. Summary of main types of SNS usage

Our first observation is obvious: all aspects of friendship - making friends, staying in touch with friends and making plans with friends are one of the main uses of SNSs in general. It is interesting to find a greater share of SNS users engage in staying in touch with friends (91%) and making plans with friends (57%) rather than making new friends (51%). This observation is an empirical support of the

findings by previous researchers suggesting that SNS is used more to connect with existing friends rather than looking for strangers to befriend [2][3][9]. In terms of understanding user preferences of SNS sites over different usage purposes, Table 11 shows that MySpace and Facebook are more widely used to establish new friendships than are other SNSs.

		Make friends		Total
		No	Yes	
Types of SNS sites	MySpace	75	77	152
	Facebook	33	34	67
	LinkedIn	21	3	24
	YouTube	1	1	2
	Flickr	1	0	1
	Others	14	21	35
Total		145	136	281

Table 11. Types of SNS sites * Make friends Cross Tabulation

Likewise, a cross tabulation between types of SNS sites and intentions to make new business or professional contacts (Table 12) shows that LinkedIn is used more widely for making new business or professional contacts relatively than are MySpace or Facebook.

		Make new business or professional contacts		Total
		No	Yes	
Types of SNS sites	MySpace	114	38	152
	Facebook	53	14	67
	LinkedIn	7	17	24
	YouTube	1	1	2
	Flickr	1	0	1
	Other	24	11	35
Total		200	81	281

Table 12. Types of SNS sites * Make new business or professional contacts Cross Tabulation

Similarly, LinkedIn is also used extensively to self-promote or to promote business than MySpace and Facebook (Table 13). Both these findings empirically validate the preference of LinkedIn for business and professional networking. This is expected finding given that LinkedIn is the most popular business networking SNS today [14].

		Promote yourself or your work		Total
		No	Yes	
Types of SNS sites	MySpace	115	37	152
	Facebook	54	13	67
	LinkedIn	11	13	24
	YouTube	0	2	2
	Flickr	1	0	1
	Other	22	13	35
Total		203	78	281

Table 13. Types of SNS sites * Promote yourself or your work Cross Tabulation

SNS users: privacy awareness and action

In order to understand level of privacy awareness of SNS users, we analysed the data on the survey question that assessed users' perceptions on how easily they thought their online identity could reveal their identity/person in the physical world. It is quite interesting to observe that the majority of SNS users (almost 80%) realise that they could be identified physically from their online profile in SNSs. This suggests that they realise the possibility that SNS usage can expose their identity to complete strangers. This observation can be illustrated in Table 14 below.

	Frequency	Valid Percent	Cumulative Percent
Missing	11	3.4	3.4
It would be pretty easy	144	44.2	47.5
They would have to work at it but they could figure it out eventually	107	32.8	80.4
It would be very difficult for someone to find out who you are from your profile	64	19.6	100.0
Total	326	100.0	

Table 14. Perception of security of SNS identity (How easy it would be for someone to find out who you are based on your SNS profile?)

In regards to application of privacy settings by SNS users, it is observed that 2 out of 5 SNS users are not mindful about privacy of their information in SNS since they do not modify settings to restrict or limit access to their profile or wall postings by others. Table 15 and 16 present these findings in regards to SNS privacy protection by restricting access to full SNS profile and by limiting who can see certain information.

This could be explained due to their lack of understanding of privacy implications of their SNS usage and risks of identity theft and fraud or a complex learning curve in providing a "safe" privacy setting, or a combination of both.

SNS Privacy Awareness Frequencies				
		Responses		Percent of Cases
		N	Percent	
SNS Privacy Awareness ^a	Restrict access to full profile	180	50.3%	87.0%
	Limit who can see certain information	178	49.7%	86.0%
Total		358	100.0%	172.9%

a. Dichotomy group tabulated at value 1.

Table 15. SNS Privacy Awareness levels in relation to SNS profile

This also presents a situation where a significant number of SNS users either unknowingly or knowingly (over 40% when allowing for missing responses) are vulnerable allowing their profile and wall information (like photos or posts) to be accessible to strangers albeit unknowingly. This finding raises a number of privacy and security concerns regarding the awareness of SNS users.

We ran a cross tabulation to further investigate SNS users awareness regarding security of their SNS identity against their intention to restrict access to their full profile and protect their privacy on their SNS (Table 16). In this scenario, it will be interesting to observe if SNS users' perception of ease in which their identity may be revealed due to online SNS profiles has impacted their action of adjusting privacy settings to their profile.

		Perception of security of SNS identity (How easy it would be for someone to find out who you are based on your SNS profile?)			Total
		It would be pretty easy	They would have to work at it but they could figure it out eventually	It would be very difficult for someone to find out who you are from your profile	
SNS privacy protection – restrict access to full profile	No	68	31	22	121
	Yes	67	72	35	174
Total		135	103	57	295

Table 16. SNS privacy protection – restrict access to full profile *

Perception of security of SNS identity cross tabulation

An interesting observation is that about one-third of SNS users believe they would not be easily identified by their SNS profiles, and possibly as a consequence of this, they do not modify their privacy settings in their SNS profiles.

Almost half of SNS users who think that it will be easy to find out about their physical identity due to their SNS profiles, still do not modify their profile privacy settings to try to take measures to prevent potential privacy leakage. Since these SNS users are aware of SNS profile privacy issues but still do not do anything about it, it might imply that they must be either not seriously understanding the repercussions of strangers identifying them from online profiles, or ignoring the situation altogether since there is no way around it and a majority of SNS users fall into these two categories.

Limitations and suggestions for future work

This study looks at limited number of SNSs, and the data collected presented a snap shot of SNS users' perceptions at a point in time. While the findings here most pertain to one dataset, we feel that the behavioral findings for SNSs represent a general contribution to the study and understanding of SNS sites usage and the apparent lack of security and privacy awareness of SNS users.

Our quantitative approach did not allow us to fully explain the behavior of SNS users on all aspects. While theory and prior work often offer compelling possibilities, interviews would add to the overall picture. Furthermore with the exponential growth of the Internet in Asia, Africa and also in the Middle East means there are large populations of SNS users specific to these regions and location- and interest-specific types of SNSs with quite different cultural and socio-economic backgrounds which were not addressed in this study. These limitations provide fertile grounds for future research in SNS user behaviours and usage understandings with different social, geographic and cultural settings and across different SNS types.

CONCLUSIONS

This paper using empirical data examined the characteristics, types of usage and the privacy and security awareness levels of SNS users. We identified that SNS users are dominated by the following demographics: younger adult age groups, college and higher education levels, and higher income levels. SNSs are used primarily for maintaining friendships and building business networks. SNS users have either poor

understanding or are complacent to the risks associated with not ensuring adequate privacy and security of their SNS profiles and online identities. This may be a result also of SNSs not providing sufficient system controls and information to allow SNS users to adequately protect the security and privacy of their SNS profiles and online identities. It will also be interesting to see how governments respond with strengthened security and privacy legislation with a number high profile cases already occurring of social network sites in regards to privacy being compromised. Our work further emphasises how a priori social patterns manifest themselves in social media even when the technology could be used to change the patterns.

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THE USE OF SOCIAL MEDIA IN MARKETING: CASE STUDY IN THAI ENTERPRISES

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ABSTRACT

The change in the behavior of media consumption and upward trend of social media users and time spent on social media websites locally and globally. These lead to a phenomenon of utilizing social media marketing as one of the most important aspects for marketing communication with the target market. This paper studies three organizations in Thailand that are well-respected and successfully utilize social media. Then, The author present a framework for implementing social media as one of the marketing communication tools for Thai organizations.

Keywords: Social Media, Framework, Marketing Communication, Thai Organizations

INTRODUCTION

The number of visitors on Facebook and Twitters has been on the rise [1] as well as the large number of viewers in YouTube [2]. Entrepreneur and organization recognize the opportunity to use those websites to reach their target markets at a much lower cost than the mass media marketing [3] [4]. These lead to a phenomenon of utilizing social media marketing as one of the most important aspects for marketing communication with the target markets [3] as more than 60% of Thai firms under the SET50 are utilizing at least one of the social media tools. However, when we look at the number of members in Facebook or Twitter, but found that less than 10% of the firms could achieve a high level of website membership [5]. The statistics show that many Thai firms do not understand the mechanism of this kind of media and are struggling on the implementation of social media to achieve their marketing communication objective. Nevertheless, there are many Thai firms who are well-respected and successfully utilize social media [6].

It is a great opportunity to study those organizations to be the case study for other organizations who been through the trials and errors and those who are looking for ways to utilize social media. The purpose of this study is to understand how certain Thai organizations successfully adopt social media as one of their powerful marketing channels including their step, process and the marketing strategy. The author limits the scope of the research to three social media tools, which are Facebook, Twitter and YouTube. The author selected these three websites as they are most popular and most

successfully utilized in marketing communication by local and international firms.

LITERATURE REVIEW

Social Media is the use of web-based and mobile technologies to turn communication into an interactive dialogue. It facilitates and encourages the interaction or 2-ways communication which is a unique characteristic of web 2.0. This creates an online community where content, knowledge, opinion are shared [7] [8] [9] [10].

There are various types of social media; however, based on the scope of the research, only Facebook, Twitter and YouTube will be discussed.

Facebook is the most popular social media [11]. As at the end of 2010, it reached more than 590 million internet users [12]. Majority of the members are target market of most of organization e.g. adult and working age [7] [13]. Business firm usually select Facebook to build customer relationship because it is a lower cost channel as compared to other channels [13] [14] [15] [16]. Twitter's characteristic is micro-blogging which limits the number of character for each message at the maximum of 140 characters, this result in the positive aspect of twitter in communicating the short and concise message to reach the customer quickly [13] [17]. YouTube is the best website to share video [18] as there are many visitors worldwide and the number of visitors is on a rising trend. Currently, more than 100 million people visit the website every day [19]. Besides, no monetary cost incurred in order to upload the video [18] [20] [21]. Nevertheless, business firm still need to integrate various channels, they cannot rely on only one website to achieve the marketing goals. [22]

The author selects 6 steps to design an interactive social media strategy [23] as the conceptual model for this study. This conceptual model has just developed in 2010, so it never has been used in past research. The details of the model are set out as below:

1. Define the target group and determine the position in the industry.
2. Find the target group online and listen to their voice.
3. Set up goals of social media strategy.
4. Choose appropriate social media tools.
5. Develop a content strategy.
6. Measure the return of social media strategy.

The relevant idea and theory of the conceptual model are as follows:-

Target group

Target group is the highest potential market segmentation [24] which business aims its marketing efforts to encourage sales [25]. It should define based on consumers psychographic and behavioral [8].

Brand Positioning

Brand positioning indicates goods and services, target group and distinctive value [26]. It sets the track of marketing activities—what the brand should and should not do with its marketing [27].

Online Target Group

It is not always the case that overall behavior and preference of the target group are the same as the online target group. Marketer should carefully conduct a research to identify who are the online target group, what are their behaviors, what are the websites they usually share idea and opinion and what are the topics [28].

Social Media Strategy Goals

Goals must specify the expected result of the strategy [29] for example: improving customer relationships, building brand awareness, inducing product trial [11].

Selecting the Appropriate Social Media Tools

Business should consider which social media tools best fit in with the goals of the strategy for example: social media is appropriate to build customer community, manage crisis situation, get feedback from customers, launch product promotion, and encourage sales etc [13].

Content

Content is contextualized data [30]. It includes the text, graphics, video, audio, link, program, e-mail, icons, logos [31] [32] [33].

Content Strategy

Content strategy is the practice of planning for content creation, delivery, and governance [31]. Business should consider what content is valuable to your target group, where to publish it and why [34]. Moreover, communicate regularly and consistently, variety and fresh content would attract attention and encourages readers to share it with their social networks [35].

Social Media Strategy Measurement

Measurement tools and metrics should align with the goals and the strategy [8] [29] [36]. Business should measure both qualitative and quantitative dimensions but separate them from each other. [37].

Based on the review of the articles, 26 questions have been raised which can be summarized in 3 major significant issues:-

1. Does the organization follow the same process as in the model?
2. Does the organization have other process beyond the 6 processes as above to implement the social

media marketing?

3. What is the strength of each process that makes the social media marketing successful?

METHODOLOGY

Based on the characteristic of research - question and major issues which need to find the answer – qualitative research on case study is the most appropriate method [38]. Purposive sampling technique has been used [39] and 3 organizations have been selected. They are (1) GMM Tai Hub Co. Ltd. (“GTH”) (2) Kasikorn Bank Plc. (“Kbank”) and (3) Tourism Authority of Thailand. (“TAT”)

These 3 entities are among the top 20 Thai firms with the highest Facebook fan page in 2010 [6]. The ranking shows the potential of the 3 entities in implementing popular social media like Facebook to successfully reach their target groups. When consider each of the 3 entities, we found that each firm use social media in a very fascinating way to attract and communicate with their customers. The use of social media marketing is one factor affecting the success of marketing strategy for each selected organizations.

GTH: Operating result increase from the rising trend of revenue from movies. Movies launched are the top highest income earning movies during 2009-2010 [40].

Kbank: Customer satisfaction increase progressively and Kbank is the leader of e-banking service in Thailand [41].

TAT: Receive PATA Gold Awards 2011 in Marketing – Primary Government Destination from “Amazing Thailand Social Networking” project. TAT also displays an impressive image for Thai tourism as a reliable and safe place for tourists [42].

Semi-structured interview has been conducted and secondary data from reliable source e.g. the firms’ official websites, news, publications etc. The data is then analyzed in 2 methods (1) within-case analysis (2) cross-case analysis. The analysis presents the similarity and difference in the process and step in implementing social media of each company in the different industry yet help the firms to achieve the objectives [43].

RESEARCH RESULTS

The analysis in both within-case analysis and cross-case analysis are divided in 3 parts as follow (1) general information of social media adoption analysis (2) implementation processes of social media marketing analysis (3) current operation and future plan analysis.

The concise details of within-case analysis are explained in table no.1.

The author brought those data in table no. 1 to analyze in cross-case. A summary of cross-case analysis is shown in the table no. 2.

Table 1: Within-case analysis

	GTH	KBank	TAT
Part 1: General information of social media adoption analysis			
Personnel in charge of Social Media	New Media and Online Business team consist of 5 people. Only 2 of them review the content and directly contact the target customer.	Consumer Segment Management Department: KBank Live	Internal team consist of 7 people and outsource team
Period of social media implementation	5 years (2007-2011)	2 years (end of 2009-2011)	3 years (2009-2011)
Part 2: Implementation processes of social media marketing analysis			
2.1 Define the target group and determine the position in the industry.			
Target Group	<ul style="list-style-type: none"> • People living in the city area, junior high school to adult who have access to the internet • Use social media as part of daily life 	<ul style="list-style-type: none"> • People living in the city area, age 18-35 years • Accept online communication 	<ul style="list-style-type: none"> • Local and foreign tourists • Use social media as travel search tool
Brand Positioning	<ul style="list-style-type: none"> • To make a fun movie with high production quality and worthwhile 	<ul style="list-style-type: none"> • Leader in technology and innovation that support banking business 	<ul style="list-style-type: none"> • Different between local and foreigner - Local - 2011: New way to travel, sustainable Thailand - Foreigner - 2011: Amazing Thailand Always Amazes You
2.2 Find the target group online and listen to their voice.			
Channel to reach and attract the online target group	<ul style="list-style-type: none"> • Word of mouth • Events and souvenir from movie • Informal communication 	<ul style="list-style-type: none"> • Events and online games which focus on member get member and high value awards • Content which is easy to understand 	<ul style="list-style-type: none"> • Communicating the social media channel through online and offline media • Create personification“ Sukjai”, casual and reachable • Consistent on the events
2.3 Set up goals of social media strategy.			
Social media goals	<ul style="list-style-type: none"> • Recognition of new movie • Stimulate decision making on the movie • Target customers suggest their friends to watch the movie 	<ul style="list-style-type: none"> • Create brand awareness • Build customer relationship • Boosting sales • Improving channel relationships 	<ul style="list-style-type: none"> • Maintain and build positive image of Thailand • Public relation and build customer relationship • Crisis management. • Strengthen entrepreneur competitiveness.
2.4 Choose appropriate social media tools.			
Selected social media tools	Start with YouTube as it matches with the characteristic of the product. The goal is for the target customer to view the movie trailer. Then follow by hi5, Facebook and Twitter.	At first, build online community through Facebook and Twitter. Follow by YouTube and Foursquare to facilitate the searching of branch location by the target customer	Start with YouTube, TripAdvisor, TripReviews, Flickr, Wikipedia, Wikitravel then follow by Facebook and Twitter.
Objectives of each tools selected.	<ul style="list-style-type: none"> • Official site: Content storage center. • Facebook: Build customer relationship and brand loyalty. • Twitter: communicate hot news • YouTube: Launch movies trailer. 	<ul style="list-style-type: none"> • Official site: Promote activities, increase brand awareness, new product and service. • Facebook: Increase brand awareness, build customer relationship and get off customer insight. • Twitter: Promote activities, build customer relationship and increase brand awareness. • YouTube: Promote activities, goods and service, and increase brand awareness. 	<ul style="list-style-type: none"> • Official site: Report news and promote activities. • Facebook: events and update on discussion and interact with tourists. • Twitter: communicate hot news • YouTube: Launch Thailand tourism TVC.
2.5 Develop a content strategy.			
Content Strategy	<ul style="list-style-type: none"> • Newly launch period - To release movie trailer - To repeat the message of the release date - To stimulate word of mouth 	<ul style="list-style-type: none"> • To present content e.g. privileges and promotion and other content e.g. health, travel and etc. 	<ul style="list-style-type: none"> • To present useful information on traveling e.g. food, hotel, weather in Thailand. • To PR travel events in each month

Table 1: Within-case analysis (Continue)

	GTH	KBank	TAT
2.5 Develop a content strategy. (Continue)			
Content Strategy	<ul style="list-style-type: none"> - To look at the comments • No new movie period - Chit-chat and events on old movie to build good relationship and brand loyalty 		<ul style="list-style-type: none"> • To discuss on social or political issue • To post not less than 3 comments per day
Content Measurement	Measure the success of the content in qualitative basis. Look at the overall response from the firm's online community and external online community.	Not specify	Measure the success of the content in quantitative basis. Impression, Interact, Retweet etc.
2.6 Measure the return of social media strategy.			
Measurement Method	Measure the success of social media on the qualitative basis as there is no quantitative goal. Focus on overall achievement, target group satisfaction and quality production (not the number of products).	Measure the success of social media on the quantitative basis by the use of statistics of each tool e.g. number of fan pages, followers, viewers, page views, comments, event attendee etc.	Measure the success of social media on the quantitative basis to align with the quantitative goal by the use of statistics of each tool e.g. number of fan pages, followers, viewers, page views etc.
Benefits from Social Media	<ul style="list-style-type: none"> • Good relationship with target customer • Listen to your customers' opinion and enhance the product to better meet their needs. • Build business partnership • Increase the number of movie seer 	<ul style="list-style-type: none"> • Establish and raise brand awareness among the online target group • Strengthen online community • Build business partnership • Increase revenue from sales and services 	<ul style="list-style-type: none"> • Convenience to communicate the news and PR the event • Suitable for crisis management • Cash flow to community and entrepreneur • Aware of tourists' behavior and their interests very quickly
Revenue from Social Media	<ul style="list-style-type: none"> • Cannot specify the direct impact of social media on the increase in revenue 	<ul style="list-style-type: none"> • Less than 10% increase in revenue from the use of Social Media 	<ul style="list-style-type: none"> • Cannot specify the direct impact of social media on the increase in revenue
Budget and rationale to adjust the budget for Social Media	<ul style="list-style-type: none"> • Increase budget on social media as the success is obviously recognized and to recruit more personnel to support the online production and the expanding online community. 	<ul style="list-style-type: none"> • Reduce the budget on social media as the firm has invested a large amount of money at the beginning of the project. The personnel have become more expertise and can manage the budget well. 	<ul style="list-style-type: none"> • Increase the budget on social media in order to expand communication channel to reach and support the event and award to the target groups.
Additional Implementation Process	Not specify	<ul style="list-style-type: none"> • Set strategy • Prepare the resource 	Not specify
Part 3 Current operation and future plan analysis			
Supporting Factors	<ul style="list-style-type: none"> • High quality product and service in the eyes of target market • Organization policy, management support on Social Media • Organization culture which open to new idea can facilitate the operation • Understanding of target groups' behavior and needs. 	<ul style="list-style-type: none"> • Organization policy, management support on social media • Understanding of target groups' behavior and needs. 	<ul style="list-style-type: none"> • Strong policy, involvement and support by everyone in the firm • Modern organization culture facilitate the operation • Integration of online and offline
Future Plan	<ul style="list-style-type: none"> • Study on new communication technology e.g. mobile phone applications, cable TV etc. 	<ul style="list-style-type: none"> • Follow up on the behavior and trend of the target customer. Study, analyze and implement new communication technology especially on the development of mobile applications. 	<ul style="list-style-type: none"> • Follow up on new communication technology and international guideline by focusing on the mobile phone applications.

Table no.2: Cross-case analysis

Similarity	Difference
Part 1: General information of social media adoption analysis	
The similarity and difference in fundamental operation of social media marketing of the selected cases.	
<ul style="list-style-type: none"> Personnel in-charge of social media marketing. <ul style="list-style-type: none"> ➢ Understanding and expertise in social media. ➢ Consistent brand identity and brand image. 	<ul style="list-style-type: none"> KBank: Start to use social media later than the other 2 organizations. <ul style="list-style-type: none"> ➢ Learn from other firms' success stories. ➢ May lead to non-creative activities. TAT: Collaboration with external agents. <ul style="list-style-type: none"> ➢ May lead to uncontrolled management and losing brand identity. <p>: Encourage the use of social media within the firm.</p> <ul style="list-style-type: none"> ➢ Reduce effectiveness of personal responsibility.
Part2: Implementation processes of social media marketing analysis	
2.1 Define target group and determine the position in the industry.	
<ul style="list-style-type: none"> Define target group clearly and align with their brand positioning. <ul style="list-style-type: none"> ➢ Crucial for developing social media strategy. Target group treats social media as an important mean of communication. <ul style="list-style-type: none"> ➢ Social media is an appropriate marketing communication tool. ➢ Impressive marketing result. 	<ul style="list-style-type: none"> TAT: Define local brand positioning and international brand positioning separately. <ul style="list-style-type: none"> ➢ Reach the need of each target group. <p>: Variety of target group</p> <ul style="list-style-type: none"> ➢ Reach all the target group by using English as the universal language in social media marketing.
2.2 Find the target group online and listen to their voice.	
<ul style="list-style-type: none"> 2 approach to attract online target group. Progressive online activities, creating game online application, and giving reward that meet the need and behavior of the target group. Interesting content style and informal conversation. <ul style="list-style-type: none"> ➢ Word of mouth increases community awareness, fan pages and followers. 	<ul style="list-style-type: none"> GTH: Concerns about target group satisfaction. <ul style="list-style-type: none"> ➢ Important for building CRM and CEM. ➢ Target group is loyal to the brand. TAT: Communicate the social media tools through online and offline media. <ul style="list-style-type: none"> ➢ Create a personification as a communication representative.
2.3 Set up goals of social media strategy.	
<ul style="list-style-type: none"> Selected cases develop and realize the goals of social media strategy clearly. They develop the goals of social media strategy based on Tools performance: speed of spreading the messages, 2-ways communication. Nature of business. Target group behavior and need. 	
2.4 Choose appropriate social media tools.	
Selecting appropriate social media tools considerations are:	
<ul style="list-style-type: none"> Tools performance fit in with nature of business. Target group's behavior, life style and interests. 	
<ul style="list-style-type: none"> Adopt 4 major social media tools. Official website, Facebook, Twitter, YouTube. Create an official website as a content storage center and supporting network. <ul style="list-style-type: none"> ➢ Easier to connect to social media. Set up specific objectives for each social media tools <ul style="list-style-type: none"> ➢ Clear goal and guideline for personnel. 	<ul style="list-style-type: none"> KBank and TAT adopt other tools beyond 4 major tools to suit different target group.
2.5 Develop a content strategy.	
<ul style="list-style-type: none"> KBank and TAT content style: Emphasize its products or services and support other issue that attract target group. Informal conversation and the right language selection to target group. <ul style="list-style-type: none"> ➢ Open communication and feedback from target group. ➢ Build good relationship with target group. 	<ul style="list-style-type: none"> GTH content style: Emphasize its products on conversations and activities. KBank: Create discussion board to get feedback.
GTH and TAT measure the effectiveness of their content strategy. However, the assessment methods are different.	
<ul style="list-style-type: none"> GTH: Qualitative TAT: Quantitative <ul style="list-style-type: none"> ➢ This is a result of the differences in vision, culture and goal. 	
2.6 Measure the return of social media strategy. (1 Measurement Method)	
<ul style="list-style-type: none"> KBank and TAT: Quantitative measurement. Align with quantitative goals. Match with well-defined management system. 	<ul style="list-style-type: none"> GTH: Qualitative measurement. Emphasize on quality of performance. Match with a more relax management style and vision.
Measurement style considerations:	
<ul style="list-style-type: none"> Style of goals Management culture 	
2.6 Measure the return of social media strategy. (2 Benefits)	
<ul style="list-style-type: none"> Direct benefits from social media adoption are: Establish a brand and raise awareness. Message reaches target market quickly. Listen, communicate and get feedback from target group directly and quickly. Indirect benefits from social media adoption: Bring wide attention to your product. Getting feedback to improve product/service quality. 	

Table no.2: Cross-case analysis (Continue)

Similarity		Difference
2.6 Measure the return of social media strategy. (Continue 2 Benefits)		
<ul style="list-style-type: none"> • Good brand image and relationship with target group. • Stronger online communities and increasing members. • Increasing business partners. 		
<ul style="list-style-type: none"> • GTH and TAT: Cannot measure the quantitative impact of social media marketing to its earnings. 	<ul style="list-style-type: none"> • KBank: Can measure the quantitative impact of social media marketing to its earnings. 	<ul style="list-style-type: none"> • : Plan to progressively increase the budget for social media marketing. • : Plan to reduce the budget for social media marketing.
2.6 Measure the return of social media strategy. (3 Implementation Process)		
<ul style="list-style-type: none"> • Selected cases implement all the 6 processes of the model. • Selected cases suggest additional processes and considerations of social media adoption: <ul style="list-style-type: none"> • High quality product/service in the eye of target market. • Develop social media strategy clearly. • Estimate and plan resource. • Everyone in the firm recognize social media marketing as an important tool. Give support and cooperation. • Integrate online and offline media. 		
Part 3: Current operation and future plan analysis		
The similarity and difference in the current operation.		
<ul style="list-style-type: none"> • Factors for social media adoption: <ul style="list-style-type: none"> • Strong policy. • Support by everyone in the firm. • Organization culture. • Realize target group behavior and need. • Barriers for social media adoption (KBank's opinion): <ul style="list-style-type: none"> • Lack of understanding in the potential return on investment. • Legal/HR risks. 		
The similarity and difference of the future plan and vision towards social media marketing of the selected cases.		
<ul style="list-style-type: none"> • Selected cases recognize the importance, benefits and potential of social media. • Selected cases always study the trends, the changes of the target group's behavior and new communication technology appropriate to their organizations. <ul style="list-style-type: none"> ➢ Ready to cope with the changes in the future. • Selected cases agree on the high potential of mobile applications. <ul style="list-style-type: none"> • Such services can help improve the effectiveness of social media marketing in reaching the target group. • The target group can also get the access to the firms' social media very easily and quickly. ➢ As a result, the selected firms have planned to develop mobile applications along with the use of social media marketing. 		

The above analysis answers three research questions as follows:-

1. Selected cases implement all the 6 processes of the model.

2. Selected cases have 2 major and 1 minor additional processes beyond the 6 steps to implement social media marketing.

Added 2 major processes:

- Estimate and plan resource.

In every project, resources such as budget, personnel, technology and etc. are important [44] [45] to carry out the task smoothly and achieve the goal. The firm need to estimate and prepare the resources after the strategy has been set but before starting the operation [46] [47] to ensure sufficient and appropriate resources are allocated to follow the plan [48].

Based on the above mentioned, resources estimation and preparation is added as the third process which follow the strategy and goal setting process but before the process of selecting the right channel/tool of social media.

- Monitor the result and impact of the changes of internal and external factors.

Even though the company receives a satisfied result; they need to follow up with the operation to improve, develop and update itself. In addition, a company should study the trend of changes in the internal factors e.g. policy, budget, personnel and external factors e.g. communication technology and consumer behavior and popularity [48] [49] [50]

[51] to be proactive to the deal with the changes in the future.

Added 1 minor process

- Set up social media strategy .

This is very important as strategy is the guideline for the firm to reach its goal [52] and to satisfy customers' needs [53].

3. Selected cases find their online target group and listen to their voice after developing content strategy. As the firm is quite certain that the target group frequently use social media, the firm then decide to use such tool in marketing communication which is different from the review of international articles as explained by Evan, 2010, it is not always the case that target customers has the same behavior or the same overall information as the online target group. Marketer should spend time to research and study who are the online target group, what are their behaviors, the websites they visit and share idea and what are the topics discussed. Moreover, the firms do not focus on the searching of online target group but emphasis on attracting the target group to visit the firm's online community by communication on the existence of various online communities, content selection, activities and rewards and the word of mouth.

The confidence that Thai organization have towards the customers' behavior in the social media and the strategy that focus more on attracting than searching the target group are as a result of the proportion of

Thai who have access to the internet which is only 18.3% of Thai population. This considered to be relatively small comparing to other countries e.g. 78.3% for North America, 65% in Germany, 99.2% in Japan etc. [54]. In addition, the highest concentration of the group, which is 36% of them, resides in Bangkok and its outskirt [55]. This leads to a quite similarity in term of the popular social media websites visited by the majority of Thai population. Most of the popular websites in Thailand are those well-known international websites and there is no obvious distinction in each city like in other countries. At initial stage, Thai start to use hi5 then Facebook increasingly become more popular [56]. From the survey, Bangkok is top 5 (with 7.4 million people) in the list of city widely subscribed to Facebook [57]. Facebook is also the number one social media channel used by Thai people at 75.8% [58]. Moreover, the selected organizations have studied and tested social media in many websites. When the target customer or the trends are towards whichever social media websites, the firms can immediately use that particular websites as a marketing tool [59] [60].

Based on the above reasons, the “searching” process should change to “attracting” process and move the attracting online target group process subsequent to content strategy setting.

CONCLUSION

From the analysis and reasons mentioned above, we can summarize into 8 processes model to implement social media in marketing communication with target group for organization in Thailand as in the below diagram no.1

The author can summarize detail in each step of the operation which affects the success of social media in each selected organizations. However, based on the cross-case analysis, we found similarity and difference. For those similarities, organizations should consider to implement in their social media operation. For the differences, organizations should consider whether they are suitable for the context of the organization. The details of the operation in each step are set out as below:

1. Define target group and brand positioning.
 - Organization should define the target group clearly, realize their behavior and understand their need.
 - Organization should make sure that target group treats social media as an important mean of communication.
 - Organization should make sure that target group aligns with Brand Positioning.
2. Set up social media strategy and goals.
 - Organization should set up strategies and goals clearly, concrete and align with each other.
 - Organization should set up goals of social media strategy based on tools performance, nature of business and target group behavior.

3. Estimate and plan resource.
 - Organization should have personnel in-charge of social media marketing.
 - Organization may consider of collaboration with external agents.
 - Organization may consider of encouragement the use of social media within the firm.
 - Organization should support and allocate resource continuously.
 - Organization should allocate resource based on past result and future goals.
4. Selecting the right social media tools.
 - Organization should make sure that selected social media tools are suitable for nature of business and fit to target group behavior.
 - Organization should make sure that selected tools align with the strategy to achieve the goals.
 - Organization should create an official website as a content storage center and supporting network.
 - Organization should set up specific objectives for each selected social media tools.
5. Develop a content strategy.
 - Organization should develop a content strategy based on target group behavior, need and satisfaction.
 - Organization may consider of emphasizing the content of products or services only or to support other issues that attract the target group.
 - Organization should create an informal conversation and using language that easy to understand by the target group.
 - Organization may consider of creating a personification as a communication representative.
6. Attract and getting feedback from the online target group.
 - Organization may consider of communicating the social media channel through online and offline media.
 - Organization should create online activities progressively and meet the need and behavior of the target market.
 - Organization should get the feedback from target group and improve the operation.
7. Assess social media implementation.
 - Organization should choose assessment method that aligns with the goals.
 - Organization may consider of both qualitative and quantitative assessment.
8. Monitor the result and impact of the changes of internal and external factors.
 - Organization should improve daily implementation regularly based on the past errors.
 - Organization should review the resource allocation and changes of the policy within the firm.
 - Organization should update on the new communication technology.
 - Organization should research on the trends and changes in the behavior of the target group.



Diagram no.1: 8 processes model to implement social media in marketing communication with target group for organization in Thailand.

Nevertheless, based on the data collected from the selected firms, cross-case analysis and additional review of the articles, I found 3 additional considerations that help the firms to successfully implementing social media to achieve their marketing communication with their target groups as follow:-

- **Strategy and implementation alignment.**

The alignment of target group, brand market position, strategy, goal, resource, tools selection, content strategy, operation and assessment play an important role for the achievement [44] as they can create a synergy and efficiency in the overall operation [44] [61] which help the organization to adapt itself to reach the goal [62] and the return on the investment [63].

- **High quality product and service in the eyes of target group.**

As the ultimate goal of marketing communication is to market the product and service, the communication of high quality product and service when the quality of product and service are in contrast would result in a negative image [59]. A good quality product and service is a very crucial fundamental factor for the marketing communication to target groups.

- **Strong policy, involvement and support by everyone in the organization.**

Strong policy, involvement and support by everyone in the firm will facilitate the overall operation of social media marketing [59] [60]. However, own tasks, responsibility and efficiency should not be sacrificed to support the social media marketing.

LIMITATION AND FUTURE STUDY

During the research process, the researcher came across 2 problem and limitations which are (1) limitation on data collection and (2) limitation on the characteristics of the research. The details are as follows:-

Limitation on data collection

- As the interviewees are personnel at high level e.g. managerial level or the director level with high responsibility, they have limited time for the interview and were not well-prepared or had the support information for the questions. This can lead to the information received from the interview may be just a primary data or personal opinion than the in-depth information from the organization. The researcher had to use

secondary data e.g. organizations' newsletter etc. which are reliable source to analyze the data.

- As certain selected organizations have strict policy on disclosure of information and restriction on the disclosure of strategy, the researcher receive data up to certain level and do not have access to the complete in-depth information.

Limitation characteristics of the research

- As the research is conducted on big organizations, certain conclusions might not be appropriate for smaller firms.

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EFFECTIVENESS OF ONLINE DISCUSSION FORUM FOR CASE STUDY ANALYSIS AND ASSESSMENT

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ABSTRACT

Business schools are exploring new pedagogical approaches to learning including asynchronous media. This paper analyses the effectiveness of online discussion forum for case study assessment in a post graduate unit in an Australian business school. Analysing quantity and quality of online postings and comparing student performance with previous cohort, this study observes a significant improvement in student learning and academic performance. Appropriate design and delivery strategies and clear assessment criteria of asynchronously using online discussion forum for teaching cases, have provided an effective learning vehicle for students, helped them overcome their own language related barriers, encouraged them to participate in a non-threatening environment. This further complemented to the benefits of peer-to-peer learning and case study pedagogy. Increase in workload for students and marking load for academics, and measuring the value of learning, however, are some of the challenges that need further attention by researchers.

Keywords:

Online discussion forum, case study, assessment, effectiveness

INTRODUCTION

The benefits of using online discussion forums and peer to peer learning for enhancing student learning are well known. In spite of that, the usage of online discussion forums in business education in general and for assessment purposes in particular, is limited. Further, difficulties of devising an online assessment and incorporating the benefits of case study pedagogy into this online forum have posed further challenges to educators in the design and effective management of these activities. Driven by the increasingly competitive higher educational environments, higher expectations of students, cultural diversity of the student population and limited availability of resources, higher educational institutions are exploring new pedagogical approaches to learning.

This paper discusses the rationale, approach and effectiveness of one such pedagogical approach that blends online discussion forum and case study analysis in an Australian business school. The objective is to combine the benefits of case study method of teaching with the online discussion to enhance the quality of learning, and, make it an assessment component in order to ensure active participation from students. This study will first briefly review the literature on the strengths and weaknesses of case study methodology of teaching and learning in classrooms, and the pedagogical use of online discussion forums in higher education context. It will then explain the approach and methodology adopted in designing and

implementing a case study based assessment component that incorporates online discussion forum in a business school. It will discuss the effectiveness of this pedagogical approach and the challenges.

LITERATURE REVIEW

Background and significance

Increasing class sizes, reducing resources and widening diversity of students' cohorts (Boud et al. 2000) have placed demands on higher education to explore new pedagogies (O'Leary 2005). Online learning has become a significant component of course delivery in higher education today (Dykman and Davis 2008). Considering the strengths of online learning and face-to-face delivery modes, blended learning model that includes the use of online discussion forum, has been one response to the changing higher educational climate (Napier & Smith 2009). Online discussion forums can potentially improve students' critical thinking and problem solving skills, decision-making ability, written communication skills and their ability to organize and analyse information (Zalpaska et al 2004). Case studies, on the other hand, are proven to be an effective way in which students can be encouraged to relate theory to practice (Hackney et al. 2003) and is a common pedagogical technique used in many business schools (Greenhalgh 2007). Over the past 15 years, asynchronous electronic discussion forums have been widely adopted as tools for online learning (Liang & Alderman 2007). Many business school academics have also started using them for teaching via the case method (Brooke 2006). While learning goals of online case discussions and face-to-face case discussions are generally same, there is relatively little research focusing on the online case-method pedagogy and assessment in business education.

Review of studies on online discussions in higher education has concluded that they are feasible and that they are viewed positively by students, and the process and outcomes are as good as its face-to-face version (Luppiciini 2007). What is not yet clear is what accounts for the variability in the quality of online discussions. The experimental, quasi-experimental, and descriptive studies relevant to this question have not produced coherent knowledge about how and when online discussion groups perform better or worse. Factors such as structure of the online environment, prior ability of students, facilitator's style and participation, however, appear to have some influence on the quality of the discussion and the outcomes. Though best practices and strategies were suggested, there were no studies that measured the effectiveness of the design and delivery of online case discussion and assessment in a business school context. Rather than comparing face-to-face and online groups like in previous studies, it is now necessary to directly investigate online groups engaged in case-based discussions and analyse the effectiveness.

With the objective of analysing the effectiveness of online discussion forums in a case study pedagogy context, this study first presents a brief review of the literature on the use of asynchronous media (discussion forums) with a particular focus on business education using case-based instructional methods. While some studies examined educational applications of online technologies in broader terms (Hammond 2005, Luppigini 2007), others suggesting best practices and strategies (Rollag 2010), this research will build on existing studies and evaluates the effectiveness of the design and delivery of an initiative that involves teaching cases through online discussion forums.

Case study assessment through online discussion

Lack of participation and dominance of a few handful students in the classroom is the main challenge in asynchronous discussion forums. As demonstrated by Swans et al (2000), grading or assessment is the currency that students deal in. Therefore, it is logical to grade students for their efforts and contribution to these online discussions. There, however, is a risk that interaction might become constrained because of the consequent fear of losing marks because of the introduction of grading. For example, the learner may think that by opening up too much on the discussion forum, he/she might expose their lack of knowledge or a level of understanding that could count against him/her. Therefore, unless a discussion forum proceeds in a non-threatening environment, the desired learning outcomes could not be achieved. As observed by Harlen and Deakin-Crick (2003), the motivation for learning can be discouraged unwittingly by assessment and testing practices. The negative impact could be worse if the weightage for the assessment task is relatively higher. In an era where the need to foster life-long learning, self-directed learning, and to develop 'learning to learn' skills are widely accepted and encouraged, the potential negative impact of online assessment is an obvious concern for educators. Even though collaborative learning is critically important, and that the technology is a powerful enabler that match what is needed for discussion and collaboration, the extent to which asynchronous discussion forums succeeded in enabling learning are questionable and lack sufficient empirical evidence.

Even though, the role of understanding technology in facilitating learning has been identified as an important research objective in business education, there is relatively little research focusing on online case method pedagogy and assessment in business education (Webb et al. 2005) other than some discussion of the best practices and strategies (Rollag, 2010). A adoption of hybrid or blended model of education that combines the mix of classroom and asynchronous and distributed learning environments, however, has been the recent trend in higher education (Cookson, 2002). Driven by increasingly competitive higher educational environment (Symmonds 2003), these hybrid models have resulted in the convergence of the traditional classroom and online learning modes (Shale 2002). Effects of these hybrid models of learning that combine traditional classroom case study pedagogy with the asynchronous media such as online discussion forums on learning outcomes and processes is, however, not well

understood leading to the adoption of many different approaches (Smith, 2001).

Two studies have examined how students perceive online case method pedagogy in business education. Jonassen and Kwon (2001) observed that the perceived students' satisfaction and perceived quality of the discussion process and outcomes, was higher for members of the online group when compared with face-to-face groups. They observed that online groups went through more cycles of the ideal problem solving process which involves defining the problem, orienting the discussion and developing a solution. Their study found that online groups produced less amount of verbal interaction than their face-to-face counterparts (Jonassen and Kwon 2001).

Comparing groups working under different 'doses' of online component in case method instruction from purely online to purely face-to-face, Webb et al (2005) found that members of groups who were under the heavy online conditions had more positive perceptions of peer interaction during the discussion. The online groups outperformed the face-to-face students in terms of conceptual and factual knowledge about the case discussed. These findings however must be treated with caution, as there are differences in the cases and topics taught to these two different groups. It is also possible that students in online groups had obtained better score because of their newly developed skills rather than because of the increasing dose of online discussion.

There are other studies that reported some challenges in online case based discussions. For example, Valaitis et al (2005) reported some confusion about navigation of online environment by nursing students. Similarly, Concannon et al (2005) found that some students (in the context of a large accounting class) who are not particularly fond of computer technologies tend to overlook critical aspects of the online environment. Online case discussion forum can be viewed as just another technology enabled tool and the principles of technology acceptance - usability, ease of use etc. will be equally applicable here. The availability of tool does not necessarily mean that students (users) will use it or perceive it as useful, and is influenced by other external factors such as incentives to participate, perceived value of those tools and past experience of the students in using those tools.

The quality of online discussion has also been addressed by descriptive studies using content analysis. Findings are mixed, with more results pointing to the difficulty of facilitating students' critical thinking or cognitive engagement. For example, Zhu's (2006) analysis of topical discussions in several undergraduate, graduate, and professional courses found that only 15-25% of the content were judged as cognitively deep. Similarly, in an analysis of education students' discussion of authentic cases, Angeli et al (2003) found that only 9% were justified (theoretically-based) claims or opinions, while 49% were unsupported or personal opinions. Other studies have also found low levels of critical thinking (de Wever et al., 2006; Garrison & Vaughan, 2008). One study which found high levels (at least 55%) of critical thinking in the online discussion was Hara et al (2000). As the discussion indicates, there is relatively little research focusing on the

online case-method pedagogy and assessment in business education and the findings are not consistent.

This research study addresses the impact of blending online discussion forum with the case study pedagogy and incorporates a significant assessment weightage to encourage active and quality participation. The findings will have the potential relevance to both higher education (Smith 2001). The findings of this study will contribute to the literature on case study pedagogy in online context, an area where existing research findings are limited (Webb et al., 2005). Next section gives a background to this particular study in an Australian university business school and explains the methodology and approach.

STUDY APPROACH

Background to the study

An online discussion of a case study is designed as an important assessment component and incorporated into this unit using some of the strategies suggested by Rollag (2010). Case study pedagogy is an established method employed in many post graduate classes in this university business school. An assessment is designed blending the online discussion forum and case study pedagogy. Recognizing the well documented benefits of asynchronous media and collaborative learning and taking advantage of the support and resources made available, author has initiated this research study.

About the unit

The post graduate unit is titled 'business process integration' and aims to demonstrate the benefits of business process perspective, and information, process and technology integration to students. The focus in this unit is to develop a thorough understanding of business processes, integration, enterprise systems concepts and change management associated with their implementation and post-implementation. Building on the basic knowledge of business information systems, management, accounting and other business processes, information flows, functional understanding (such as marketing, accounting) learnt in other units, and drawing knowledge from sales/marketing, accounting, logistics and human resources disciplines based subjects studied earlier, this unit aims to develop a multidisciplinary view of the business. The conceptual content that is covered in this subject includes business processes, business cycles, making a business case for the need, selection and implementation of enterprise systems, implications of ES implementation for organizations emerging from the latest research on enterprise systems. The unit incorporates variety of teaching methods that include lectures, case study discussions, laboratory demonstrations of the SAP software, hands-on exercises on the SAP software and emphasizes both conceptual and theoretical content as well as procedural knowledge of the software.

Assessment task and its administration

The assessment task incorporates online discussion forum and case study pedagogy in this unit. This online case study discussion is one of the key assessment components and requires students to answer the questions that deal with the challenges in the implementation of enterprise systems, critical success factors and challenges in post-implementation. The objective was to help students demonstrate their ability to work collaboratively using online discussion forum moderated by the lecturer and resolve their differences in developing an optimal solution using synergies generated through collective wisdom and peer-to-peer learning. It requires students to participate in an online discussion forum on a weekly basis for 4 weeks in a semester that spans 13 weeks. During this time, they are expected to demonstrate their individual ability to apply the concepts and theories of enterprise systems and suggest workable solutions to the problems/issues raised in a comprehensive case study.

All students were given a comprehensive case study that deals with the enterprise system implementation (about 7 pages length) in week 3. As it is important to get the discussion going in right direction, the instructor explained the learning objectives of the case study, its background, and intended discussion flow. Prior to this, in weeks 1 and 2, two classroom based short case study discussions were conducted to give students some understanding of the content related issues and to give some practice on case study analysis. Four questions were set on the case study. First question was posted in week 3. Second question was posted in week 4 and third question in week 5 and the fourth question in week 6. The objective of posting these questions, one at a time was to synchronize the questions with the lecture materials and to manage the flow of the discussion. Each question was designed to deal with one aspect of the enterprise systems discussed in one or two weeks lecture prior to the posting. The objective was to provide theoretical understanding of the issues to students before they attempt to answer the case study question. In order to narrow down their focus on one aspect at a time and to concentrate on the issue at hand, these questions were posted one after another in the online blackboard so that students do not have any idea of the questions and specific details that would appear subsequently.

Students were expected to post their responses within that time frame in the relevant thread created in the blackboard discussion forum. Frequently, depending upon the need, a facilitator/lecturer will participate in the discussion. Facilitator was monitoring the discussion by providing clarifications on the questions, asking leading questions, correcting major deviations and kept the discussion focused on the main issue. In order to limit the grading load and also to encourage students to reflect, read others' views and build on them before posting, a limit of three responses per question per student was set. Though this limit is set, the number of postings made per question is not a criteria in the assessment grid and focus is on the quality of postings.

Students therefore were asked to post only three submissions in the discussion forum. In addition, they were encouraged to read widely outside the text book and lecture

notes and provide references to their responses in the forum. Once the deadline has passed for a particular question, students were not allowed to edit their responses. They, however, are allowed to see the responses already posted by all the students and use that knowledge while answering the next question.

At the beginning of the semester, a sheet detailing the expectations of students and the assessment criteria were given to students. This assessment criterion was designed considering the learning objectives of this assessment component, practicality of administering the grading and key principles of assessment design. The dimensions and their descriptors for grading purpose were developed from several sources such as Oxford Brookes University's business assessment criteria grid, Washington State University's guide to rating integrative and critical thinking and this university business school graduate attributes. The criteria thus developed consists of five dimensions – i) identification of issues and problems, ii) consideration of context and application of theories and principles, iii) analysis of data and evidence in the case study, iv) effective written communication and, v) responsive contribution and integration.

Students were given a grid that explains each of the dimension in a scale of 1 to 6 (1 to 2 = Poor; 3 to 4 = Average; and, 5 to 6 = Excellent) with some descriptors. For example, the dimension of 'responsive contribution and integration' is described as 'Poor' when the student *"simply mentions other contributions but neither explains the relevance nor adds to it"* and/or when there is *"no evidence of integrating other's views and perspectives"*. Similarly, it is termed as average when student *"makes references to earlier works that are starting point for new ideas, but not much information is incorporated"*, and/or makes *"rough comparison and integration of multiple viewpoints."* A response is rated 'excellent' when the student *"links ideas posted by others to their own, responds to others' contribution by elaboration, critique, demonstration of linkages among earlier contributions, and/or utilization of an earlier contribution as a foundation to build his/her own,"* and/or if there is *"evidence of integration from a variety of sources and timeliness of posting."* Thus, the objective of this assessment grid was to provide students some information about the expectations and requirements in providing their responses and to encourage them to take advantage of the benefits of collaborative learning and case study pedagogy. As the focus is on the quality, the assessment grid does not contain any information about the number of postings.

Data collection and analysis

Students' responses for each of the question were their primary data used in this study. In addition, students' perception of the entire process was also being collected using semi-structured interviews. The approach taken in the analysis was to content analyze the responses of students and examine their feedback on the effectiveness of this online assessment task and its pedagogical benefits. The content submitted by the students in response to the case study questions were used to help determine the acceptability of the task in terms of the following criteria –

effectiveness of the case study methodology in helping to develop skills and knowledge, its contribution to the achievement of the main learning outcomes and its ability to reinforce the theoretical concepts taught in the class. Further in the interviews, participants were asked to give their views on the structure of the learning environment including the online discussion forum, appropriateness of the weightage assigned to this assessment task, timing and level of difficulty of the case study questions and participation by the academic as a moderator. From a total sample of 48 students, 8 students have volunteered to be interviewed and provided a qualitative feedback.

The objective of content analysis was to assess the quality of responses and online discussion interaction. Rather than positioning the discussion interaction as a dependent variable along with the learning outcomes, a post-hoc measurement approach was used in this study as suggested by Baron (2003). According to this, the discussion interaction and quality of the responses were considered independent variables in relation to learning outcomes. Baron (2003) suggests alternative ways of conducting content analysis which involves qualitative analysis of the discussion or focusing on the responses related to proposed solutions to the case study questions. The second approach was adopted in this study which involves qualitative analysis of the student responses. The preliminary analysis of this qualitative data, findings and anecdotal evidence collected in this study are presented in the next section.

ANALYSIS AND FINDINGS

Demographics:

Demographics of the 48 respondents participated in this study are presented in table 1 below. As noted in the table, 68% of the participants were international students from countries such as Hong Kong, Singapore, Thailand, Indonesia, China, India, Pakistan, Bangladesh, Scandinavian countries, Germany and USA. Even though this unit was offered by the business faculty, 41% of the students enrolled in this unit came from the schools of information technology, computer science and engineering and the remaining from business school.

Table 1 Demographics of respondents

C	Characteristic of respondents	Percentage
1	Proportion of International students	68%
2	Students from Information technology, computer science or engineering	41%
3	Percentage of students currently employed	38%
4	Percentage of students below 25 years of age	65%
5	Percentage of students with previous work experience	42%
6	Percentage of students who have completed more than 4 business related units/subjects	35%
7	Percentage of students who have completed more than 4 information technology/systems related units/subjects	42%

On the employment indicator, data revealed that 38% of the students were currently employed while 42% of the students have some previous work experience. With more than 65% of the students below the age of 25 years, age was not considered a major differentiating variable.

Previous knowledge of business functions, business processes, information systems and technologies gained in other units is expected to determine the prior content knowledge student may have and therefore can have an influence on their learning experience in this unit. Therefore data on the completion of previous units before enrolling in this unit was collected and presented in the table above.

Quantity of responses

Each participant is expected to submit responses to four questions posted in the online discussion forum. There were 268 valid responses for all the four questions, i.e., on average 67 responses per question or 1.40 responses per question per student. The number of the responses posted by the participants is presented below. As shown in the table 2, the number of responses per student has gradually increased from 1.1 per student for the question 1 to 1.63 per student for question 4 and demonstrates gradual increase in students' interest and intensity of their participation in online discussion by increasing the number of submissions.

Table 2 Number of responses posted by student

Number of responses posted by students	Question 1		Question 2		Question 3	
	No	%	No	%	No	%
ZERO	1	2% 0		0% 0		0%
ONE	42	88% 37		73% 28		62%
TWO	4	8%	8	17%	13	25%
THREE	1	2% 3		6% 7		11%

Except the third question all the remaining three questions are content based and deal with subject specific issues such as enterprise systems implementation challenges and critical success factors. The third question also deals with the enterprise system, but requires students to develop an artefact, a mapping structure for implementing the enterprise system. Even though each student is allowed to post up to three responses to each of the question, very few posted three responses. Though this proportion has gone up from the first question to the fourth one (2% to 11%), a majority of students simply posted one response. Even though the marking grid supplied along with instructions for the case study assessment clearly specified the frequency and number as one of the criteria, a large proportion (about 70%) of students submitted just one response.

Timing of responses

In terms of timing, about 50% of the respondents posted their response on the due date, while about 25% of students posted in the first two days. As shown in table 3 below. Most of the students who have posted in the first two days,

have posted second response suggesting that they have read other postings.

Table 3. Timing of responses posted by students

Timing of responses posted by students	Q1	Q2	Q3	Q4
First response posted in the first two days after question is made available	20%	28%	32%	38%
First response posted on the due date	55%	40%	37%	32%
Response posted between day 3 to last day	25%	32%	41%	30%
Sub total – responses	100%	100%	100%	100%

Analysis of the responses suggests that students were hesitant to submit their comments in the initial stages and are generally waiting for a leader to post first. About 20% of the respondents submitted their first response in the first two days while about 55% of the students submitted their response on the last day for the first question. This, however, has improved as the students become familiar with the process and started realizing the value of collaborative learning. For the fourth question, number of students who submitted their response on the first day increased from 20% to 38%, while the percentage of students who submitted their response to the fourth question on the last day has improved from 55% to 32%. Thus there is clear improvement in the frequency of participation and the intensity of participation in the online discussions.

Quality of responses

Based on the criteria set out for assessment purposes, the quality of written responses was analyzed and a summary is presented below (table 4). One of the objectives of online case discussion is to facilitate exchange of ideas, views and information among students, and peer-to-peer learning and develop the solutions using the collective wisdom. It is therefore important to check whether there is any evidence that students are reading and understanding each other's ideas/contributions. It is necessary to analyze whether students are building on each other's contribution by elaborating, criticizing and/or integrating.

Table 4 Summary of analysis

Content analysis	Q1	Q2	Q3	Q4
No evidence that the student read/understood others' ideas/contributions	56%	44%	54%	34%
Responding to others contribution by elaboration/critique or building up	15%	21%	31%	36%
Evidence of good analysis of the case study data	32%	41%	39%	44%

Evidence of using & citing other sources/references in the response	17%	18%	21%	24%
Demonstrable understanding of the questions and identification of issues in case study	21%	27%	33%	39%
Effective written communication	64%	72%	56%	71%
Evidence of pooling different ideas, expertise and information in the development of an artifact (related to question 3 only)	NA	NA	45%	NA

Analysis of the responses as shown in table 4 revealed that about 56% of the students did not show any evidence of that for the first question. This has gradually improved and for the final question about 66% of the students have demonstrated this characteristic in their response. Similarly, while only 15% of the students have responded to others' contribution and developed a solution for the first question, about 36% demonstrated such skills for the fourth question. From the data it is clear that students are reading each other's views and responses and adding further using their own references and knowledge. Data confirms gradual improvement through collaborative learning, a key objective of introducing asynchronous discussion forum. Because of the clear instructions at the beginning of the case study discussion, none of the responses are simple and irrelevant such as "I agree", "I disagree", or similar and every response is consistent with the criterion. On the effectiveness of the case study pedagogy, analysis revealed that there is good evidence of improvement from the first question to the last question (from 32% to 44%) on different aspects as shown in table 3.

Academic performance

In order to measure the impact of online case discussion on the academic performance of students, the grading of the current cohort of students in this assessment component was compared with a previous cohort of students in the same unit. In the past students were asked to submit a written analysis of the case study after face-to-face discussion of the case study in the classroom. Online discussion forum has not only increased students' participation in the case study discussion and also contributed to increase academic performance. The table below gives an indication of their overall academic performance for each of the question and overall assessment and compares with the previous cohort of students.

Table 5 Performance in the Assessment task

Performance in the assessment task	Current Cohort of students (with online discussion forum)				Old cohort *
	Q1	Q2	Q3	Q4	Overall
Average and below average performance	60%	46%	40%	38%	46%
Credit performance	34%	40%	38%	36%	37%
Distinction performance	6%	14%	22%	26%	17%
Total	10	100	100	100	100

* This cohort of students did not have online discussion forum for case study analysis and assessment.

Grading data shown above reveals consistent improvement from the first question to the fourth question. As pointed out earlier, in addition to the improvement in quantity and quality of responses has improved from question 1 to question 4, online discussion of case study has facilitated improvement in academic performance also. Thus the asynchronous media has facilitated collaborative learning and improved learning.

Improvement in learning

In order to determine whether this model of learning (case study analysis through online discussion forum) has contributed to improvement in learning or not, a comparison was made with the previous cohorts of students where no such asynchronous medium was used. Except this assessment component, all the remaining aspects of the unit were exactly similar to the current one in terms of the learning outcomes, content, delivery methods and general assessment components. For the previous cohort of students, a case study analysis was used as an assessment component, while the same case study analysis is used to the current cohort of students using asynchronous medium for discussion and submission of students' responses.

Using independent samples t-test at 5% significance level, the actual performance of the students in this assessment task as well as the teaching evaluation are compared between these two groups of respondents. This comparison reveals a clear improvement in the overall performance of students in the assessment task as well as in their feedback on the unit through student evaluations of unit and teaching at the end of the semester. It is therefore safe to conclude that the asynchronous medium used for case study analysis has not only improved student learning in terms of achieving the learning outcomes, it also contributed to the effectiveness of teaching and learning measured in terms of the improved unit evaluations. A summary of the t-test results are presented below.

Table 6 t-test results: Differences between two cohorts of students

(one with online discussion case study assessment and one with written assessment)

Construct	Independent variables & significance	Values
Performance in the case study task	<ul style="list-style-type: none"> • Online assessment cohort (48) • Normal assessment cohort (42) • T-value • Significance 	65.9 56.4 5.065 0.000*
Overall teaching evaluation score	<ul style="list-style-type: none"> • In online assessment (48) • In normal assessment (42) • T-value • Significance 	4.10 4.52 3.098 0.000*

Subject evaluation score in this unit has marginally improved from 4.1 to 4.52 in a scale of 1 to 5. The curriculum and delivery of this unit are quite different from other standard units delivered by this school. This unit incorporates SAP, an ERP software solution and teaches students the concepts of business process integration and enterprise systems along with SAP software skills. The curriculum incorporates hands-on laboratory sessions and these hands-on components typically made this unit interesting and contributed to good evaluations i.e. 4.10, before introducing this online discussion assessment. The introduction of online discussion forum has further contributed to improvement in learning as well as in students' satisfaction. In qualitative feedback, a significant number of students (62% of them) pointed out online discussion forum as an important learning component. Informal feedback and comments from students also reflect a generally positive endorsement to the online discussion. They have observed that the exchange of views and ability to asynchronously post their responses online have encouraged them to interact more and better and facilitated their learning. They have acknowledged the benefits of peer-to-peer learning which they believe would not have happened without this online discussion. This online discussion has also helped them better in deriving the benefits of case study pedagogy. Thus, significant improvement in the quality of responses and observed improvement in students' academic performance on this particular assessment task indicates the contribution of this strategy to deep learning, given the structure of the assessment and content.

Challenges

In spite of such positive endorsement, some challenges are identified. They include reported increase in students' workload because of the online discussion forum, inability to freely express their ideas and views because of the assessment involved, restriction to the number of postings per student per question, in sufficient moderation by the lecturer and some subject-related issues. About 85% of the participants believed that the weightage given to the assessment task was appropriate and motivated them to actively engage in the discussion and learning. Some

students, however, viewed the weight given to this single assessment component (15% of the overall assessment weight), as a major constraint in freeing up the discussion. About 10% of the participants observed that their participation would have been better and creative if there were no assessment attached to this online discussion. Past experience of this author teaching this unit, however, suggests that participation and submission of case study discussions were very limited (practically none) when there was no assessment attached to it.

Academic administration of this online discussion forum has been a challenge. With each student posting on average 1.6 postings per question the total number of postings have reached about 300 and enormously increased the marking load to the academic. In addition, the need to monitor the discussion forum, edit some unhelpful comments, redirect the debate to the issues relating to the subject content and to provide hints have all added to the normal teaching and administrative load. In addition to this, some of the typical challenges in case study pedagogy have also resurfaced during the discussion. They include request for one single answer to the case study questions, inability to comprehend the case study materials by some, inadequate English language skills of students, inability to apply theoretical frameworks, skills in scoping out, assumptions and analysis.

CONCLUSIONS

Teaching in emerging disciplines such as business process management and enterprise systems in business schools is challenging because of the dynamic nature of the subject content, diverse nature of student cohorts, non-availability of localized case studies, required multi-disciplinary focus and other institutional factors such as large class sizes, and increased competition for scarce resources and students. Integrating e-learning technologies such as discussion forums with the traditional case method pedagogy has the potential to change educational processes and enhance the quality of learning in this environment. The preliminary findings of this study suggest that by using online discussion forum for case study analysis, and incorporating that in to assessment, the business school is offering students a high-quality learning environment that facilitates effective peer-to-peer learning and flexible interactive discussions.

Data suggests that students perform better in an environment where a mixture of classroom and online technologies are employed. The peer-to-peer learning, a gradually diminishing feature of the contemporary classroom based case study discussions is enhanced by transferring those discussions to an online environment. Introducing this as a part of a compulsory assessment component contributed to enhanced student learning. In general, students perceived improvement in learning because of the online environment and appreciated the opportunities it has provided for deeper understanding of content-based issues, a appreciation of multiple views expressed by students, and reflection of their own learning and perceptions. Though it is early days in understanding the effectiveness of these blended learning models, their contribution to the improvements in the quality of

discussion and the depth of learning in a higher educational environment appear to be significant and can be further expanded. Thus, the online discussion forum offers a powerful forum for highly interactive and constructive case study discussion in business schools. The workload involved in setting up, monitoring and assessing the online discussions though is significant, it is possible to make it less burdensome by efficient design and structure of the initiative and appropriate faculty workload policies.

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Enhanced MediaWiki for Collaborative Writing in the Web 2.0 Era

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ABSTRACT

The primary goal of this case study research is to investigate users' perceptions of the efficiency of MediaWiki used in the collaborative writing process for students in graduate classes. MediaWiki version 1.15.1 was used in this study. Two case studies were used to explore situations that were occurring as students used the MediaWiki instance. The results show that MediaWiki needs some additional features, such as chat, advanced text editor, and discussion to facilitate the collaborative writing process.

Keywords: MediaWiki, collaborative writing, group writing in higher education, web 2.0, education technology.

INTRODUCTION

The collaborative writing process relates to social nature because group members need to communicate and participate. MediaWiki is considered a social technology tool for collaborative writing in the Web 2.0 era. MediaWiki was chosen as the platform for this study because it is one of the world's most popular Wikis. For example, Wikipedia runs on MediaWiki because it is easy to install, configure, and use. In this study, students use MediaWiki as a tool to construct their own knowledge and at the same time, they use MediaWiki as a medium to distribute their knowledge when working with each other. Design mechanisms in MediaWiki should be able to fulfill this dichotomy because they have to be practical for users who have the role of author, reader, reviewer, or editor. In order to design the mechanisms for MediaWiki that suit the needs of the classroom, this study addresses the following research question: what mechanisms can be designed to enhance collaborative writing in classroom settings?

CASE STUDY METHODOLOGY

The case study research method is used to address a contemporary phenomenon, such as an event or activity within its real-life situation [1] [7]. This method is used to

examine a single case or a few related cases that involve development of detail [5]. Information gained from case study research is mostly descriptive, involving various sources (i.e. interview and observation) in order to understand the demonstration of complexity of the phenomenon being examined [2]. In this research, two case studies in classroom settings were conducted. The two case studies emphasized detailed information about two small groups of participants and were used to explore and describe the complexity of the processes taking place as a result of using the MediaWiki instance designed to enhance the collaborative writing process. Qualitative research reveals complexities and provides insights that quantitative research or fixed designs cannot achieve [4]. Individual interviews (either face-to-face or by telephone depending on participants' availability) were conducted to collect the users' perceptions.

Population and Sample

The population for this study included students in two graduate classes that use MediaWiki as a research-intensive learning tool for collaborative writing. A convenience sample was selected because this study relied on the professor using MediaWiki in the classroom and students who volunteered to participate. The sample consisted of two sets of students who were required to use MediaWiki to complete classroom assignments. More importantly, they were real world users in a collaborative writing process and a part of the learning community of users.

Procedures

The procedures used to conduct each case study are outlined in this section. Students in both classes were assigned projects that had to be written up and finished within a specific timeline. The first case study was conducted in a graduate research methods class where students were required to conduct reviews of academic papers in a group format. The second case study was conducted in a

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knowledge management (KM) class that required students to collaboratively write a group essay.

Case Study 1: Group Review

This case study investigated collaborative writing in the reviewing process. [3] proposed that Wikis might suitable for use in reviewing. In this case study, one of the main assignments for the course was to review academic papers with students having two assigned roles: author and reviewer. The instructor acted as the Associate Editor. Each student worked with other students in his or her group as a reviewer to comment on and discuss their reviews with other students.

According to [3], Wiki-based review, if conducted the right way, can enhance the speed and quality of the review process. Rather than having each reviewer work on his or her own review separately and then submit it to the editor, he or she has opportunities to look at other reviewers' opinions and would be able to work with them directly to discuss issues in that paper. If any reviewer agreed or disagreed with any points of the paper, he or she could comment and reply back and forth with other reviewers.

The instructor provided two articles for review. The first article was reviewed between weeks 2 and 4 of the class by using standard MediaWiki. The second article was reviewed between weeks 5 and week 7. After that students were asked to participate in interview sessions about how they felt about MediaWiki, and about what kind of features they would like to have to support their collaborative writing process.

Case Study 2: Group Writing

In this case study, one of the main assignments of the course was writing essays. Students were assigned three roles: Author, Reviewer, and Associate Editor. The instructor acted as the Editor-in-Chief. Each student's main responsibility was to work with assigned groups to write essays in a topic area. The essay was expected to be between 1,500 and 2,000 words, and followed a predefined structure. The essay was to be completed during a six-week period using a MediaWiki instance. All students contributed to the writing, editing, and reviewing process; and one student was assigned the role of associate editor to coordinate the process.

DATA COLLECTION

Semi-structured, open-ended questions were used to interview students. Audio recordings were made with permission. The following key questions were used for the evaluation process: what are the advantages and the disadvantages? What features would they like to see implemented to aid them in the collaborative writing process? Why would they like to see these features implemented, and in what way do they believe these features would help them? The interviews took between 20 minutes

and an hour, with an average of 30 minutes. The difference in interview time depended on the amount of opinion(s) the participant wanted to contribute.

DATA ANALYSIS

The interview data was transcribed and the coding schemes were manually created. The researchers carried out the following activities: transcribing the recordings of the interviews and reading each student's transcription, and developing and defining a set of coding categories, and assigning category codes. Relevant information from interviews was classified by selecting the relevant phrases and sentences. To classify the relevant information into the defined categories, tables were created where the column heading represented the participants' code and the row heading represented the defined categories, and coding symbols were placed into the appropriate cells where any relevant information from each participant referred to the defined categories. Descriptive statistics were used to analyze interview data. Revising the coding categories was done as redundant or unclear coding categories were found.

To increase accuracy and completeness and prevent selective memory bias, when the transcribing was completed, the researchers immediately began coding. Inter-reliability was achieved by having someone else transcribe sections of the transcript that were then compared with the researcher's transcriptions to ensure they were the same. To increase intra-reliability and consistency, after completing the coding, random sections of the transcripts were chosen. These were then coded again and compared to the first round of coding to ensure that the coding was the same in both instances.

RESULTS

In Case Study 1 (see Table 1), the participants were eight graduate students between the ages of 20 and 50. Four participants (50 % of the class) were between 20 and 30 years of age, two participants were between 31 and 40, and the other two were between 41 and 50. Four of them were male and the other four were female. Two of them were Master's students, and the other six were Ph.D. students. Three participants had used Wikis before and knew how to configure MediaWiki. In Case Study 2 (see Table 1), the participants were twelve graduate students with five between 20 and 30 years of age, three between 31 and 40, three between 41 and 50, and one participant older than 50. Eight of them were male and four were female. Eight were Master's students and the other four were PhD students. Five participants had used Wikis before and two participants knew how to configure MediaWiki. Eleven of twelve students allowed the researcher to conduct interviews. Two of them were interviewed by telephone and nine were interviewed face-to-face.

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Table 1. Overview of Both Case Studies

	<i>Case Study 1</i>	<i>Case Study 2</i>
Course	Seminar in Research Methods	Knowledge Management
Class size	N = 8	N = 12
Age	20-30=4(50%) 31-40=2(25%) 41-50=2(25%)	20-30=5(41.7%) 31-40=3(25%) 41-50=3(25%) 50+=1(8.3%)
Gender	M=4(50%) F=4(50%)	M = 8(66.7%) F = 4(33.3%)
Degree	Master=2(25%) PhD=6(75%)	Master = 8(66.7%) PhD = 4(33.3%)
Have used Wikis in classrooms	Yes=3(37.5%) No=5(62.5%)	Yes=3(25%) No=9(75%)
Know how to configure MediaWiki	Yes=3(37.5%) No=5(62.5%)	Yes = 2(16.7%) No = 9(75%) Missing =1(8.3%)
Group size	4 (2 groups)	4 (3 groups)
# of group writing assignments	2 review papers	1 essay
Time	3 weeks /1 paper	6 weeks /1 essay
Roles	Author and reviewer	Author, reviewer, and editor

The perceptions of the students in the two classes towards standard MediaWiki are quite similar (see Table 2). In Case Study 1, seven of eight students in the class were interviewed. Two had positive perceptions of MediaWiki, while another two had negative feedback. The other three had both positive and negative impressions of MediaWiki. In Case Study 2, eleven of twelve students were interviewed. Four had positive perceptions of MediaWiki, while three had negative perceptions. The other four had somewhat positive perceptions of standard MediaWiki.

Table 1. Comparison of Students' Perceptions towards Standard MediaWiki

<i>Perceptions towards standard MediaWiki</i>	<i>Case Study 1 (n=7; missing=1)</i>	<i>Case Study 2 (n=11; missing=1)</i>	<i>Both Cases (n=18; missing = 2)</i>
Positive	2 (28.57%)	4 (36.36%)	6 (33.33%)
Negative	2 (28.57%)	3 (27.27%)	5 (27.78%)
Somewhat positive	3 (42.86%)	4 (36.36%)	7 (38.89%)

Advantages and Disadvantages

Nine of eighteen students from both classes agreed that the most important advantage of MediaWiki is that the user interface is easy to use and navigate (see Table 3). Student B10 noted that although he and his friends are computer science savvy, they were overwhelmed with the new Web applications, Web 2.0, and social technologies. He felt that he wanted something that was easy for him and his friends to catch up with and MediaWiki seemed to be an easy-to-use application for them.

Table 3. Comparison of Advantages of Standard MediaWiki's User Interface and Features

<i>Advantages of Standard MediaWiki's Interface and Features</i>	<i>Case Study 1 (n = 7)</i>	<i>Case Study 2 (n=11)</i>	<i>Total (n=18)</i>
User interface and navigation are easy to use	4(57.14%)	5(45.45%)	9(50%)
MediaWiki Markup is not complex	1(14.28%)	1(9.09%)	2(11.11%)
History tab	1(14.28%)	1(9.09%)	2(11.11%)
It is easy to find information in MediaWiki	2(28.57%)	0(0%)	2(11.11%)
Free and Open Source	0(0%)	2(18.18%)	2(11.11%)
Layout of MediaWiki is simple	1(14.28%)	0(0%)	1(5.55%)
Ensuring assignment submission	1(14.28%)	0(0%)	1(5.55%)
Saving drafts	1(14.28%)	0(0%)	1(5.55%)
Scalable	0(0%)	1(9.09%)	1(5.55%)
Flexibility and robustness	0(0%)	1(9.09%)	1(5.55%)
Watchlist	0(0%)	1(9.09%)	1(5.55%)

Yet, five students from both classes said that MediaWiki did not have a user-friendly interface(see Table 4). This contrast is quite compelling. The plain interface of MediaWiki might be a double-edged sword. While some students consider MediaWiki easy to use, it does not provide a user-friendly interface. It might be too primitive to provide what the users currently need. Other Wiki instances such as Wikispaces and PBworks (or PBWiki) provide user-friendly Wikis. Users are able to change font colors and styles, insert files, images and media, and so on, without any knowledge of Wiki markup. Their interfaces are more stylish than MediaWiki, provide

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simple toolbars, and allow users to use most features without installing any additional extensions as in MediaWiki. However, the extensions and features cannot be freely customized like MediaWiki. If MediaWiki's interface can be made more user-friendly, it would be both easy to use and user friendly.

Table 4. Comparison of Disadvantages of Standard MediaWiki's User Interface and Features

<i>Disadvantages of Standard MediaWiki's Interface and Features</i>	<i>Case Study 1 (n = 7)</i>	<i>Case Study 2 (n=11)</i>	<i>Total (n=18)</i>
Not a user-friendly interface	2(28.57%)	3(27.27%)	5(27.78%)
Text Editor	1(14.28%)	2(18.18%)	3(16.66%)
MediaWiki markup	1(14.28%)	1(9.09%)	2(11.11%)
Discussion tab	2(28.57%)	0(0%)	2(11.11%)
Spacing	0(0%)	2(18.18%)	2(11.11%)
Date and time	1(14.28%)	0(0%)	1(5.55%)
Numbering	0(0%)	1(9.09%)	1(5.55%)
Help section in MediaWiki	0(0%)	1(9.09%)	1(5.55%)
Unorganized and content too large	0(0%)	1(9.09%)	1(5.55%)

Most-Used Features

The feature that a majority of students from both classes used the most was the history tab (see Table 5). For example, five students in Case Study 1 and five students in Case Study 2 used the history tab. They used the history tab because they were able to identify changes other students in the class made as well as when they made them. Another feature that students used the most was the discussion tab (see Table 5). One reason they used the discussion tab was that it was required by the instructor to complete assignments.

Table 5. Comparison of Most-Used Features

<i>Most-Used Features</i>	<i>Case Study 1 (n = 7)</i>	<i>Case Study 2 (n = 11)</i>	<i>Total (n = 18)</i>
History tab	5(71.43%)	5(45.45%)	10(55.56%)
Discussion tab or talk page	4(57.14%)	5(45.45%)	9(50%)
Recent Changes	4(57.14%)	1(9.09%)	5(27.78%)
Watchlist	2(28.57%)	1(9.09%)	3(16.66%)

Most-Liked Features

A feature of MediaWiki students from both classes liked the most, which is consistent with the advantage that students

addressed, is the ability to see other students' postings and the ability to share their knowledge and experience (see Table 6).

Table 6. Comparison of Most-Liked Features

<i>Most-Liked Features</i>	<i>Case Study 1 (n = 7)</i>	<i>Case Study 2 (n = 11)</i>	<i>Total (n = 18)</i>
See other students' posting and able to share knowledge	2(28.57%)	3(27.27%)	5(27.78%)
Everyone can edit and post anything	1(14.29%)	1(9.09%)	2(11.11%)
History tab	1(14.29%)	1(14.29%)	2(11.11%)
Recent Changes feature	1(14.29%)	0(0%)	1(5.55%)
Signature and timestamp	1(14.29%)	0(0%)	1(5.55%)
Discussion page	0(0%)	1(9.09%)	1(5.55%)
Table of contents	0(0%)	1(9.09%)	1(5.55%)
Ease of communication	0(0%)	1(9.09%)	1(5.55%)
Easy to use	0(0%)	1(9.09%)	1(5.55%)

Least-Liked Features

A feature of MediaWiki students disliked the most is the characteristic of MediaWiki that allows anyone to change anything without any approval (see Table 7). This issue created frustration for them. Students from Case Study 2 felt that their writing belonged to them; therefore, they should be informed before other students can change their work.

Table 7. Comparison of Least-Liked Features

<i>Least-Liked Features</i>	<i>Case Study 1 (n = 7)</i>	<i>Case Study 2 (n = 11)</i>	<i>Total (n = 18)</i>
The ability to edit without notification or approval	0(0%)	3(27.27%)	3(16.67%)
Spacing	0(0%)	2(18.18%)	2(11.11%)
Editing interface	1(14.29%)	1(9.09%)	2(11.11%)
Disorganization of Wiki	1(14.29%)	1(9.09%)	2(11.11%)
Does not have sum of Recent Changes	1(14.29%)	0(0%)	1(5.55%)
Inconvenience in using the discussion tab	1(14.29%)	0(0%)	1(5.55%)
Does not have live interaction	1(14.29%)	0(0%)	1(5.55%)

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<i>Least-Liked Features</i>	<i>Case Study 1 (n = 7)</i>	<i>Case Study 2 (n = 11)</i>	<i>Total (n = 18)</i>
Difficulty in finding content	0(0%)	1(9.09%)	1(5.55%)
Does not have track changes	0(0%)	1(9.09%)	1(5.55%)

Interestingly, this negative impression only came from Case Study 2 but not from Case Study 1. This finding reveals several concerns. First, students in the KM class felt that their writing belonged to them and did not want other students to change it without any notification. The instructor might need to take this issue into account and consider that MediaWiki in classrooms does not work like Wikipedia because some students did not prefer to have others edit their postings. Second, the reason why the ability of anyone in MediaWiki to change anything caused trouble in Case Study 2 but not in Case Study 1 might be linked to students' perceptions that were described earlier. They felt that they did not work as a group; instead, they felt that they worked individually. This could be the reason that no students from Case Study 1 had this concern.

Additional Features

The feature that students from both classes most wanted was email notification (See Table 8). Figure 1 compares the number of students who proposed this requirement in each case study. For instance, four students from Case Study 1 and three students from Case Study 2 requested email notification when content was updated.

Table 8. Comparison of Additional Features

<i>Additional Features</i>	<i>Case Study 1 (n = 7)</i>	<i>Case Study 2 (n = 11)</i>	<i>Total (n = 18)</i>
Email notification	4(57.14%)	3(27.27%)	7(38.89%)
Approval (supervisor) and acknowledgement	4(57.14%)	2(18.18%)	6(33.33%)
Chat	3(42.86%)	2(18.18%)	5(27.78%)
Advanced text editor	1(14.29%)	3(27.27%)	4(22.22%)
Enhanced discussion	3(42.86%)	1(9.09%)	4(22.22%)
Google Docs-like feature	2(28.57%)	2(18.18%)	4(22.22%)
A more user-friendly interface (Customizable)	0(0%)	4(36.36%)	4(22.22%)
Online interaction	0(0%)	3(27.27%)	3(16.67%)
SMS notification	0(0%)	3(27.27%)	3(16.67%)

<i>Additional Features</i>	<i>Case Study 1 (n = 7)</i>	<i>Case Study 2 (n = 11)</i>	<i>Total (n = 18)</i>
Use other collaboration tools	1(14.29%)	2(18.18%)	3(16.67%)
Track changes	0(0%)	2(18.18%)	2(11.11%)
Protect and control mechanism	1(14.29%)	0(0%)	1(5.55%)
Who-is-logged-on feature	1(14.29%)	0(0%)	1(5.55%)
Page statistics	1(14.29%)	0(0%)	1(5.55%)
Real-time whiteboard	1(14.29%)	0(0%)	1(5.55%)
Sum in Recent Changes	1(14.29%)	0(0%)	1(5.55%)
Rating feature	1(14.29%)	0(0%)	1(5.55%)
Private space	0(0%)	1(9.09%)	1(5.55%)
Set a deadline	0(0%)	1(9.09%)	1(5.55%)
Font color	0(0%)	1(9.09%)	1(5.55%)
Rule settings	0(0%)	1(9.09%)	1(5.55%)
Learning measurement	0(0%)	1(9.09%)	1(5.55%)

The next most wanted “feature” was a supervisor who oversees the writing project (see Figure 1). It sheds some light on the necessity of a person who has the authority and responsibility to supervise the writing project. As mentioned earlier, students did not want other students to change their postings before receiving acknowledgement, and they would like to have a supervisor or administrator who decides which edits should be accepted. Therefore, the instructor should consider this need when deciding if/when he or she would like to apply MediaWiki for collaborative writing in a classroom.

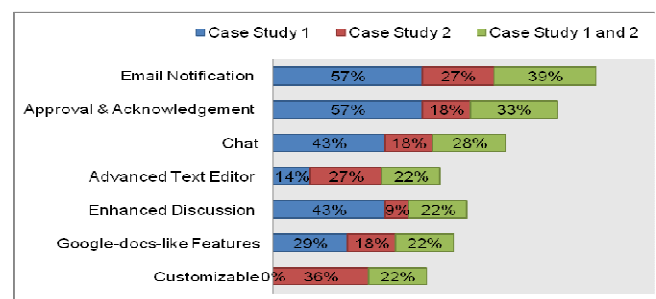


Figure 1. Comparison of Additional Features

The next most wanted feature was chat functionality (see Figures 1). An advanced text editor, enhanced discussion, a Google Docs-like feature, and the capability to customize the layout and user interface were additional features that students suggested. The insights gained from the interview

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data highlighted the necessity to provide other functionality to support students' needs in collaborative writing.

Answers for Research Question

The answers for Research Question – “What mechanisms can be designed to enhance mandatory collaborative writing?” – come from interview findings. As described earlier, features that students used the most were the history and discussion tabs. Features that students liked the most were the ability to see postings from other students and to share knowledge and experience amongst classmates. However, the feature that the students liked the least was that MediaWiki allowed anyone to change anything without any notification or approval. These findings related to design mechanisms are summarized in Figure 2.

Students were asked to address any ideas or suggestions that were not included in the interview questions. The students from both classes most commonly suggested that MediaWiki should not be used for the class. Student pointed out that they did not have enough time to learn how to use MediaWiki before the class started. Some students might not be accustomed to the specific characteristics of MediaWiki. Some of them found it difficult to understand MediaWiki's technical terms and markup. One student said that they should have been given time during the first couple of weeks before the first assignment was given to learn and become familiar with MediaWiki. This problem illustrates the need for an appropriate time period for students to learn how to use MediaWiki. This might also be mitigated if the instructor designs an initial assignment or some tutorials to help students in learning how to use MediaWiki before they really start to use it for their collaborative writing assignments.

In addition, the same student also compared MediaWiki with other social media, such as Facebook. Students pointed out that they would like to use some applications that they are familiar with and use almost every day. If the instructor would like to apply MediaWiki in the classroom, he or she might need to consider how to customize the user interface to be more user-friendly or ensure that students understand how to use the tools and functions they need.

Another student who had experience with other Wikis addressed the same problem about limited learning time and requested training or a better help feature. With a limited time to finish assignments, students merely tried to finish their assignment without having time to learn how to use the tool.

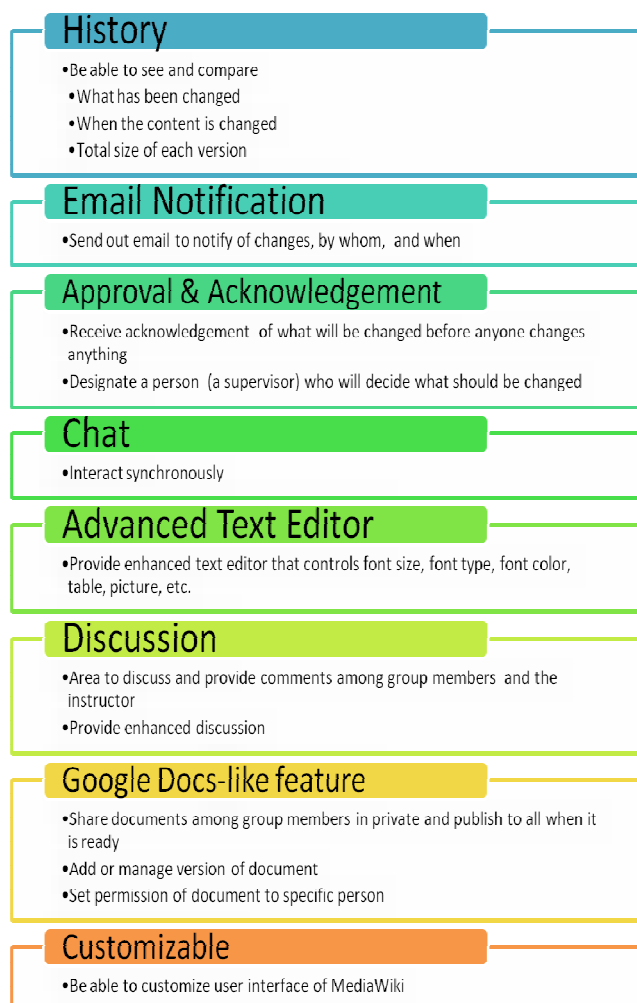


Figure 2. Summary of Mechanisms to Be Designed to Enhance Collaborative Writing in Classroom settings

The instructor did not anticipate that students would find it difficult to self-learn MediaWiki. Students from both case studies were in the Information Systems and Technology field and accustomed to the digital era, but some of them still struggled with MediaWiki.

CONCLUSIONS

Studying a single user who uses MediaWiki, or setting up an experiment for a group of users in a lab setting, may not be able to reveal the design problems [6]. This research applied case study research to explore what features an instructor needs to take into account when he or she wants to apply MediaWiki for collaborative writing in graduate classes. A Wiki is considered a social technology tool for collaborative writing, but when MediaWiki is used in classroom settings, some new mechanisms and further refinements are needed.

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The findings from this study led to a set of pragmatic features to enhance group collaboration in the graduate classroom environment.

Implications

The findings from this research can be useful for developers and educators. A significant facet was discovered: Determine benefits and limitations of the wiki to be used to support learning activities. For developers, the results of the interviews indicated that talking to students can guide developers who want to enhance standard MediaWiki in order to enable it to support activities such as collaborative writing. Developers can make use of what students considered disadvantages in the user interface and in writing mechanisms as well as using a list of additional features students thought were important. However, this also means that students would have to use standard MediaWiki for these activities, which is contrary to the finding that instructors should give students significant time to learn the system.

Limitations

Threats to validity in this research might also include Reactivity. The researcher may be considered a threat to students when showing up in the classroom and informing them that data will be gathered from them. The researcher was in the classes the whole semester, which might affect the behavior of students in the class. This limitation was reduced by informing students that their answers did not affect their grades, their involvement was voluntary, and the findings from this research could help improve MediaWiki.

Future Research

In future research, researchers can explore more by adding or customizing additional features that enable more students to collaborate effectively; an example would be by reaching consensus. Another interesting avenue for future research is developing a mechanism to promote group awareness and make students feel engaged in collaborative learning activities.

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THE IPAD: A TABLET TOOLKIT SUPPORTING BLENDED AND FLEXIBLE LEARNING

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ABSTRACT

Learning has shifted along the learning continuum from the traditional face-to-face classroom into interactive ICT-supported environments. The 'cone of learning' assists in understanding this learning shift. Emerging portable ICT content management systems (CMS) such as the iPad offer new student-empowered, interactive, non-linear, self-learning opportunities. The 'interactive 3 P learning system' framework presented herein, enables researchers to test the effectiveness (and value) of the iPad as a mobile student CMS across blended and flexible learning environments. This environment enables testing for improved student personal interactivity (and recognition), and for improved student learning outcomes (measured (i) quantitative student-perceptions, and (ii) qualitative achieved-results).

Key Words: Blended, learning, flexible, interactive, dynamic, instruct, iPad, avatar, virtual world.

INTRODUCTION

Learning has shifted from a traditional or face-to-face instructional approach and may now be positioned depending on circumstances and time at various along a continuum. Traditional learning is moving into blended learning, and some are aspiring to attain fully flexible learning [16]. At present, tertiary institutions engage various degrees mid-line or blended learning approaches into their instructional systems [17].

Simple blended-enabled approaches may just add blackboard or WebCT delivery systems as a means to add a small degree of student interactivity. Higher levels of blended-enabled learning may add videos, podcasts, or ICT supported tasks [13]. Blended-enhanced learning is far more interactive and engaging. Here, students may negotiate, and individualise aspects of their learning programs in conjunction with their instructor or institution.

Fully flexible learning involves in individually contracted complex mix of timing and flexibility; content and flexibility; entry requirements; instructional and resources deployment approaches, and delivery and logistics [9], along with the delivery of the 'what', the 'where', the 'when', the 'how' and aspects of the 'why' associated with the learning processes that may be engaged as potential contributors to the individual student-agreed learning processes [17].

Biggs [7], Bonk and Graham [8], Cybinski and Selvanathan [10], Michinov and Michinov [22],

Georgouli, Skalkidis and Guerreiro [11], Hamilton and Tee [17] show differences in learning and engagement approaches as four instructional learning modes (face-to-face, blended-enabled, blended-enhanced or flexible). These learning modes, framed upon Biggs [7][26] 3P system model of learning, are presented in Figure 1 by as a 'Cone of Learning' continuum [14]. Here, a student's increased learning outcomes are directly related to the complex mix of targeted learning situations/activities that engage the student (factors) and contribute to their learning situation.

These complex multi-pronged learning offerings are moderated by the instructional mode engaged, with traditional face-to-face learning being the least engaging, and flexible learning being the most interactive and engaging. For first year tertiary students progression from traditional to blended learning yields around a 60% increase in learning outcomes, with flexible learning delivering an additional 15% increase [13]. This movement into blended learning is desirable.

The 'Cone of Learning' widens as additional learning capture and delivery processes are added to optimize student learning outcomes. Here, new learning tools (often technology-based) continue to emerge and when added to the array of active learning instruments may move the existing learning mode system further up the learning continuum. This transition may result in jagged (and not smooth) expansion in cone breadth as an adopted change in the learning system may be great or small.

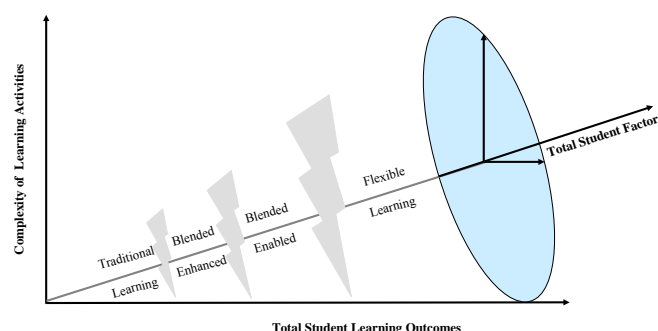


Figure 1: The Cone of Learning Reconstruction, a adapted from Hamilton and Tee [13].

The 'Cone of Learning' also displays blurred boundaries between different teaching and learning modes. Michinov and Michinov [22] support the blurring of boundaries between the face-to-face and blended teaching and learning modes, and Georgouli, Skalkidis, and Guerreiro [11] indicate a similar situation between blended and flexible teaching and learning modes.

As most learning mode approaches are now blended we concentrate this study on blended learning.

BLENDLED LEARNING

Blended learning typically incorporates information and communication technologies (ICT) into its learning exchange environment. It often involves the student in interactive information 'give-and-take' situations [2]. Here, an established learning content management system (CMS) such as a simulation or gaming learning program or an interactive on-line classroom responds contingently to the student's specific actions [4]. Thus, the student contributes individually to aspects of the learning environment, and so participates in blended-enhanced learning.

Interactivity through ICT empowers students to learn, and better prepares them to effectively participate in the evolving global knowledge economy [5].

Interactivity in a blended learning environment enables and engages students in their knowledge building. Here, students are often self-directed and must accept both greater autonomy and responsibility for their own learning [5][6][18].

Self-directed learning directly contributes to the student's life-long learning process of learner control, learner self-management, personal autonomy and autodidaxy [3]. It enhances the student's readiness to take responsibility for their own learning activities.

Self directed learning necessitates information literacy and this may involve interaction with a range of content management systems.

New forms of ICT such as Tablet PC's have built expectations of significantly enhanced teaching and learning outcomes [23]. Tablet PC's accept and digitize handwriting, whilst merging text, drawings and other notations [5]. Such additions have allowed teacher-student feedback insertions in real-time, thereby increasing both relevance and problem solutions [21].

Social networks and other tools accepting 3D virtual world avatar instructors are adding further practical and training dimensions to interactive blended learning [25].

3D virtual worlds instruction is well suited to students involved in experiential or interactive learning where high knowledge and skills acquisition is of importance [20]. However, educators lack understanding of such of environments and of their applicability across geographic boundaries. Role-play sessions with individual virtual characters interacting across various scenarios can provide rapid and deep understanding regarding a situation [19] and can generate broad interactivity between avatars. This also builds new rules for student collaboration and social interaction [25].

The pedagogy of 3D virtual worlds allows the instructor to recreate the traditional classroom into a blended one that

leverages the unique characteristics of the technology platform. Chat logs, learning artifacts, post activity semi-structured interviews and instructor observations cumulatively generate rich experiences and deliver pedagogy in action [12].

By creating educational spaces, a virtual clothing, non-verbal communication tools and visualisation situations in a blended learning environment. Andreas et al. [1] found they could augment face-to-face interactions, improve distance learning and communication and enhance aspects of collaboration within their virtual learning space. Hence, ICT related tools can deliver value adding blended learning experiences, but instructor appreciation of capabilities to develop such systems remains a weakness.

The Apple iPad offers tertiary blended learners an other emerging ICT-based interactive learning system. Its touch-screen tablet in conjunction with its user-selected (or user-developed) apps, plus ebooks Google Earth (with some GPS functionality) and other accessories delivers both an entertainment tool and a creative learning tool that links the learning tools into a dynamic interactive learning environment.

The Apple iPad allows students and/or users to develop their own apps, and to tailor their iPad to specifically suit their own requirements. For example, the student may build business utilities, entertainment components, shopping advertising and news connections into their interactive marketing course. The student can also overlay additional sketch/draw figures and add them between their inbuilt keyboard's entered lecture notes. Here, keyboard entries are continually linked (pegged to the last type-entered word) and coincide with words recorded at that point in time in the lecture or discussions. When also connected to 3G further downloads may also be incorporated. Finally, with the appropriate apps stored PowerPoint slides may also be appropriately pegged into this information integration system delivering a comprehensive learning program with each student tailoring these media combinations to their individual learning requirements.

This complex interlinked package may be further student modified to incorporate connections to relevant videos whilst still allowing the learner/user to jump between email, video, internet browsing and other data-heavy apps, or to read iBooks, plot GPS destination paths, and then to store their complete lecture notes, integrated media materials and sound tracks package as one unlinked file.

Thus, the iPad breaks new ground in portable computing and is a platform for instructors and/or developers to create new and innovative apps. USB ports, WIFI, 3/4G, HDMI, a micro-SD slot and a front-facing webcam further expand existing connectivity and learning power, supporting non-linear student knowledge absorption from its multi-sensory environment (multimedia text elements, graphics, animation, sound, video, experiential/learning avatars) supported by cloud computing information syncs.

Such non-linear learning ICT supported environments allow the student to move around their acquired content in a manner best-suited to their particular learning requirement and/or skill level [24]. This self-directed approach caters for the student's individualistic needs in learning, and typifies the higher levels of blended-enhanced learning [13].

Chou, Peng, and Chang [4] consider such ICT approaches (3D virtual worlds and/or the iPad) as a learner-centered CMS capturing five learner-centered interaction types: (1) student-interface interaction via an ICT device or iPad screen; (2) student-self interaction via reflections, or iPad lecture playbacks; (3) student-content interaction via multi-media engagement in 3D worlds or via iPad component selection; (4) student-instructor interaction via selected digital communication channels or iPad connections; and (5) student-student interaction via digital encounters, forums or via selected digital/iPad peer-to-peer communication engagements.

Thus, tablet PC's such as the iPad have CMS capabilities that may enhance student learning outcomes. Hence, this article develops a model to test the iPad and other tablet PC's as a CMS capable of integrating delivered interactive learning approaches and of delivering positive blended-enhanced learning outcomes.

MODEL DEVELOPMENT

The iPad engages supporting ICT platforms, captures and stores diverse CMS data, frames around delivered pedagogy and is likely contributor to the blended-enhanced or flexible learning system.

We now combine these components into our 'blended interactive and dynamically changing learning system. We note Sabry and Barker [26] also recognize dynamic interactive learning as a system.

We adopt the extensively studied Biggs 3P learning system model [7] to operationalise our blended interactive and dynamically changing learning system. We present this research framework as Figure 2 - our interactive 3P learning system.

Student Factors

Student factors house prior-knowledge, abilities, intelligence, personality and home background, motivation and other skills brought to the learning environment.

Teaching Context

Teaching context encompasses instructional mode, subject area, course structure and learning tasks as enablers of the learning environment. Here interactivity may be incorporated as content (course databases, CMS, on-line resources and simulations), technology (CMS support, WiFi/iPad), and pedagogy (blended enhanced delivery)

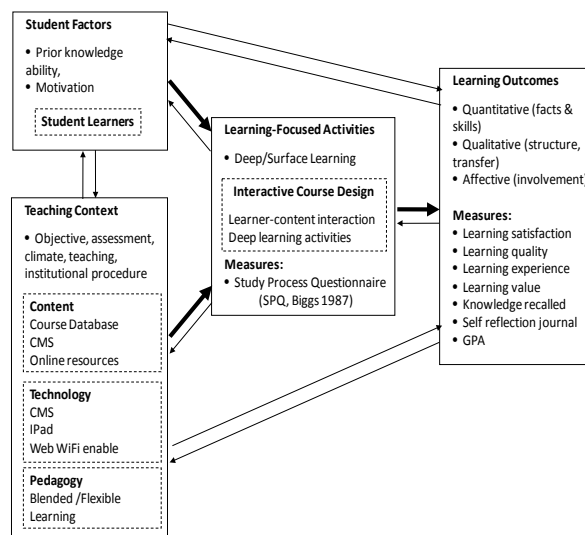


Figure 2: Interactive 3P Learning System.

Learning-Focused Activities

Learning-focused activities typically involve surface learning and/or deep learning and/or achieving strategies approaches. Here, interactivity is actioned through iPad integration, and is measured by survey (an adapted Biggs SPQ 1987 approach) results and achievement around learning outcomes.

Learning Outcomes

Student learning outcomes may be the quantifiable measures of academic achievement and/or the qualitative measures of how well material is learned or experienced, and may result in a net grade or set of graduate attributes. This is measured by a series of qualitative and quantitative measurement scales.

RESEARCH ASPIRATIONS

The interactive 3P learning system framework presented above, when integrated as a series of iPad applications enables virtual learning. This combination offers a means to test the effectiveness (and value) of the iPad (1) as a student CMS under both blended-enhanced and flexible learning options, (2) as an effective student learning device, and (3) as a medium to advance the progress towards flexible learning.

In this paper we aim to (1) explore whether two specific virtual world learning environments – each operating at a different learning level, and with different iPad application sets (one a flexible mode delivery and one a blended enhanced mode delivery), can produce enhanced student acceptance of the learning derived through a virtual world environment.

Along with [25] we suggest the iPad allows student learning to advance considerably. Hence, we also test for (2) improved student personal interactivity (and recognition), along with (3) improved student learning outcomes (measured (i) quantitative student-perceptions, and (ii) qualitative achieved-results).

RESEARCH SETTING AND METHODOLOGY

This study is implemented through an experimental design approach using a pre-course questionnaire to all participants, two streams from Undergraduate and two streams from Postgraduate students. One stream (iPad trained) and the other a control stream of volunteers confident they can complete tasks without an initial iPad training session. Postgraduate and Undergraduate teams complete a questionnaire, and normal assessments. Results are then compiled and compared against respective student learning outcomes.

All Postgraduate and Undergraduate participants are provided with iPads, and offered pre-course iPad training to allay the fear of working in such a learning environment. This also offers participants sufficient capabilities to manage the work/learning demands when engaging within this virtual world environment.

A virtual world teaching avatar developed by the authors for medical intern training is used to deliver the interactive instructional component of the lecture within a virtual classroom facility. Here course slides, videos and activities, are discussed - with some virtual chat clarification (FAQs offered as lecturer response). Models are drawn and explained sequentially, interactive student-student tasks and instructional guidance are embedded throughout the process. Students preparing assessment items can revisit past sections which are linked together. Thus, a keyword search for website 'benchmarking' links the word to slides, linked notes, videos, avatar lecture verbiage, and external website/publications as stored in the lay-down of the course materials. This enables student learning to advance considerably the capabilities of those who experience normal teaching environments, and a usable virtual learning environment is created for both student and lecturer, and a truly flexible learning environment is created.

Our second approach to enhanced learning through virtual environments involves less interactivity, and no lecturer student avatars, but uses embedded lecture video clips linked to slide content and other materials. This delivers a blended-enhanced environment with improved interactivity and recognition, a long with improved perceived and real student learning outcomes.

CONCLUSION

The iPad offers new empowering interactive self-learning ICT interfacing opportunities. It is a technology rich way to add value within the learning domain, and to train students into (and through) engaging online learning activities. This ICT tool again moves the learning environment well into the interactive blended-enhanced and flexible modes of learning [2][15].

We have presented the well studied interactive 3P learning system framework as our entrance approach to iPad-

engaged virtual world learning. When supported by a quality student CMS and engagement system (which takes time to develop), we suggest the iPad becomes an effective student learning device.

We explain our approach to studying this virtual world environment, and we suggest a long with others that the iPad allows student learning to advance considerably. We test for this by gauging whether improved individual student interactivity (and recognition), along with improved student learning outcomes actually arise.

Our initial studies building virtual emergency wards in hospitals to train new doctors and interns convinces us that this is a pathway to enhanced learning. Hence, we remain convinced the iPad delivers a portable anyplace, anytime, virtual, interactive means whereby students may effectively learn beyond the classroom.

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M-HEALTH: A MOBILE APPLICATION FOR MONITORING ACUTE RESPIRATORY DISEASES (ARDs)

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ABSTRACT

One of the most widespread epidemics is ARDs. Because of a limited number of hospital beds and hospital staff, hospitals cannot provide sufficient service and support to large numbers of suspected ARD patients. Many patients who are suspected of having acquired ARD have normal vital signs and can be transferred to home care service. Due to the possible incidences of deaths, this paper is aimed to propose a suspected ARD patient monitoring and controlling system by using mobile technology to remotely monitor home care patients with suspected ARD in order to reduce the difficulties of caring for these patients.

Keywords: Mobile application, Acute Respiratory Diseases, Mobile-based monitoring and controlling system, Infectious disease monitoring, Home care monitoring.

INTRODUCTION

Acute Respiratory Diseases (ARDs) are group of diseases which their route of transmission is airborne and droplet transmission. Epidemics and pandemics of ARDs (e.g. bird flu and AH1N1 flu) have widely spread to world populations, thus the monitoring and controlling of epidemic of ARDs are required [7] [8] [10]. ARD symptoms include fever, cough, sore throat, coryza, shortness of breath, and wheezing or difficulty in breathing [11] [12] [13]. Because ARDs symptoms are almost like the symptoms of general respiratory tract infection and influenza, high risk patients and patients with the ARDs criteria were considered to admit only.

Actually, people who are contaminated with pathogen caused ARD can be categorized to two groups: ARDs patient and suspected ARDs patient. In epidemic period, there were two difficulties to support contaminated patients: limited hospital beds and insufficient hospital staff. Thus, patients who have the early symptoms of ARDs or suspected in ARD have transferred to home care service because patients in this group have a normal vital sign. The current monitoring and control in the period of ARDs epidemic focus on patients who were admitted in the hospitals. Home care patients with suspected ARD cannot make a decision when they should visit hospital; it lead to the incidents of death of

ARDs patient who had the criteria symptom ARDs at home. Although every country implements public health practices, all these practices are often not enough to monitor and control an epidemic. For this to be successful, many countries apply technology to healthcare with the aim to monitor and control epidemics by distributing to their populations health knowledge related to epidemics. The two main technologies currently used to provide health services for people are electronic-based and mobile-based applications.

To apply technologies into health services, health websites have been created to provide knowledge related to epidemics. People can search for more information to prevent and protect themselves from the spread of epidemics. In addition, health applications are created to collect patients' information, predict, and locate epidemics. However, a geographic gap and a socioeconomic gap have been identified in the use of electronic-based applications and health websites. Many low-income people do not have their own computers and electricity services do not cover remote areas. Because of these two gaps, inequitable access to health services remains a problem.

With the development of communication technology, mobile technology can be applied in the healthcare system. Many projects related to epidemics have been produced and implemented in numerous countries, especially in the developing world. However, there are only a few mobile applications to monitor and control epidemics because it is a more complex application than surveying and providing knowledge. The widespread ARD epidemics and the deaths of ARD patients from severe symptoms are because existing systems do not provide rapid detection of ARDs. Therefore, the development of a new mobile application to support early detection in ARDs is required. The main objective of this study is to apply mobile technology to monitor and control ARDs patients at home by: 1) identifying the suitable pattern to monitor and control suspected ARD patients at home; 2) identifying the suitable mobile application development tool to develop a mobile application to monitor and control suspected ARD patients; and 3) developing a mobile application to monitor and control suspected ARD patients.

LITERATURE REVIEW

This study reviews the epidemic control in ARDs including mobile technology and tools used to monitor and control ARDs. WHO [27] defines ARDs as “upper or lower respiration tract illnesses, usually infectious in etiology, which can result in a spectrum of illnesses ranging from asymptomatic or mild infection to severe and fatal disease, depending on the causative pathogen, environmental, and host factors”. There are many pathogen caused ARDs such as H5N1, AH1N1, and Streptococcus. The route of transmission of ARDs is airborne and droplet, thus this group of diseases can be developed from endemic to epidemic or pandemic quickly after its spread. The symptoms of ARDs include fever, cough, wheezing, and difficulty in breathing and the initial treatment of ARDs is based on patients’ symptoms. Specific treatments are used after physicians have recognized the results of blood tests or nasal swab test for pathogen culture. Vaccinations have been produced and used for prevention, but only after an epidemic has spread. The standard management for suspected H1N1 and H1N1 patients was introduced by WHO [28] for the last H1N1 epidemic in 2009. The algorithm used to manage patients with suspected ARD based on hospital treatment capability. When ARDs contaminated patients visit a hospital, they were treated based on patient’s symptoms. Contaminated patients who have high risk for complication (for example, patients with chronic cardiovascular diseases, chronic broncho-pulmonary diseases, pregnant women, over 65 years old and younger than five years old), and contaminated patients who have severe symptoms of ARDs are considered to admitted in hospital and treated with anti-viral drug [21] [26]. However, many contaminated patients are diagnosed as suspected ARDs or the diseases related to respiratory tract infection, such as pharyngitis, influenza, and upper respiratory tract infection have transferred to home care service [2] [9] [15]. They had to take care themselves at home.

There were many mobile applications introduced in healthcare services based on five application types: health education awareness, remote data collection, remote monitoring, communication and training for healthcare workers, and diagnostic and treatment support [24]. A mobile application for remote monitoring is applied to monitor high distant home care patient such as a chronic patient with stable symptom. There were several applications developed to remotely monitor patients. A summary of features and functions of mobile health applications in remote monitoring category is shown in Table 1. Only SIMpill Solution for TB provides the decision support function. However, its function suggests

the simple method to resolve the problem in patients who forget to take medication. The Mobile Care Support and Treatment Manager (MCST) application provides two types of usage, namely, group and individual, and the former allows group members to share their care experiences with each other. Most mobile health applications [20] for remote monitoring use a PDA as the mobile device and applications installed for individual usage. Most servers have operating systems compatible with a mobile device platform; this allows mobile applications to work as dependent platforms. Therefore, people who want to use the system need to have a mobile device with a compatible operating system to run an application.

Table 1: A comparison of mobile health applications for remote monitoring

Features & Functions	Report	Security	Alert System
Application Name			
Cell-Life (created for health workers) [3] [4] (www.cell-life.org)	text	Yes	no
Chinese Aged Diabetic Assistant (CADA) [5] (www.cadaproject.com)	no	Yes	no
Colecta-PALM for HIV treatment support [6] (http://colectapalm.org)	no	Yes	no
Mashavu: Networked Health Solutions for the Developing World [14] (www.ideablob.com/ideas/1528-Mashavu-Networked-Health-Solu)	no	yes (physician)	no
Mobile Care, Support and Treatment Manager (MCST) [18] (www.freedomhivaidsonline.com/mCST.htm)	text	Yes	yes (alarm setting)
SIMPill Solution for TB [22] (www.SIMPill.co.uk)	graphic	No	yes (massage)
Virtual Health Pet [23] (www.tridedalo.com.br/fabiane/index.htm)	no	No	yes

Mobile technology has become an important technology to provide convenient communication especially in remote areas. Mobile technology consists of three main components, which are wireless network technologies, mobile devices, and mobile application development tools. The development of each component has to support the other. There were many wireless network technology developed and each type of wireless network technology provides the different speed and range of coverage. Applying wireless network technology to health projects, project managers have to consider the issue for mobile health, such as security, bandwidth, and supported device. Notebook PC, handheld PC, and smart phones are the favorite devices used in the mobile health

projects.

In summary, there are two main elements that directly affect the development of mobile applications to support the remote monitoring and controlling of epidemics in patients with ARDs. They are domain knowledge in epidemic control and development of technology. All population groups have the same opportunity to contact an ARD because it is caused by a pathogen that spread in the air and in shared areas in public places. An effective mobile application should support various mobile device platforms. In addition, any mobile application to be used to monitor and control patients with suspected ARDs should help users to early detect the ARD before patients become severely sick with ARD symptoms.

SYSTEM ANALYSIS

The system consists of five elements to support the remote monitoring and controlling of ARD suspected patients (see Figure 1). Firstly, a mobile web application server is utilized to manage all system functions and to generate the suitable markup language for each mobile device after a WAP or HTTP request is received. Secondly, a wireless network infrastructure is used as the communication media between mobile devices and servers. Thirdly, a system database is used to store data from both users (hospital staff and ARD suspected patients) based on a database schema. For the fourth element of support, the hospital staff use PCs or laptops to access the system for checking their patients' progressive symptoms, and lastly, ARD suspected patients use a mobile device to access the system to monitor and control their symptoms.

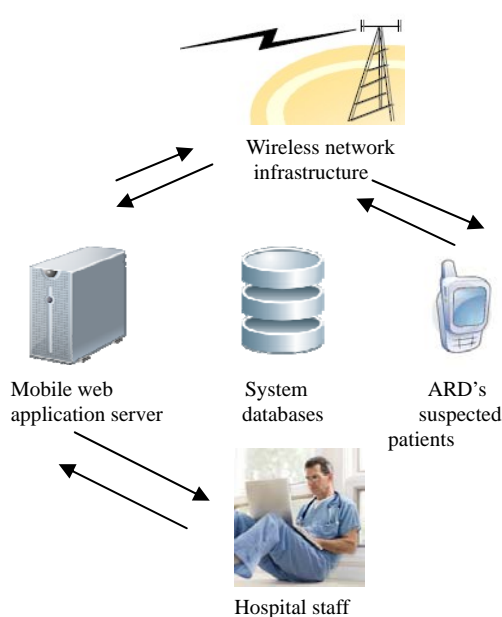


Figure 1 System architecture

Case Study: The Royal Thai Marine Corp Healthcare Unit

The Royal Thai Marine Corp Healthcare Unit is located in The Royal Thai Marine Corp in Chonburi Province, Thailand which provides the services of a primary hospital. It has one physician and 23 nurses who take care of The Royal Thai Marine Corp personnel and it provides 100 hospital beds to support its patients. To control the most recent ARD epidemic (H1N1 flu), this healthcare unit provides a screening room to investigate patients who have the influenza-like symptoms. Moreover, all hospital beds in this healthcare unit are for influenza-like symptoms only. Patients who have other diseases or symptoms that require admission are directly referred to H.M. Queen Sirikit Hospital after being investigated by hospital staff. A Royal Thai Marine Corp Healthcare Unit report (2009), states that in the period of the H1N1 epidemic situation (June - September 2009), 326 patients visited this healthcare unit and every day new cases were admitted. The infectious control guidelines, which are used in this healthcare unit, are based on the guidelines for infectious control for ARDs.

The Royal Thai Marine Corp Healthcare Unit has two work shifts: office hours (8.00 to 16.00) and after hours (16.00 to 8.00 the following day). A physician and two nurses are on standby to take care of patients during the office hours but only two nurses are on standby to take care of patients after hours. In the H1N1 epidemic period, all patients who were diagnosed with a common cold, influenza, pharyngitis, tonsillitis, unidentified cause of fever, and upper respiratory tract infection were admitted for observation of ARD symptoms [19]. These patients were observed for fever for seven days and if they did not have a fever (body temperature lower than 37.5°C) they were discharged. If their fever was equal to or more than 38.5°C for three consecutive days, they were diagnosed and treated as ARD patients. Following this, the hospital staff immediately referred all ARD patients to the infectious control unit of H.M. Queen Sirikit Hospital for proper treatment.

System Requirements

The system works as a medical application, thus the two requirements are required: domain knowledge requirement and users' requirement. These requirements are used to create functions for monitoring and control home care patients with suspected ARD.

Firstly, the domain knowledge requirement was gathered from interviewing three experts including an infectious control consultant, a home visit nurse, and a supervisor nurse. An infectious control expert recommends that the

Ministry of Public Health of Thailand's pattern and investigation form be used to monitor and control suspected ARD patients at home. The expert also suggests requirements for infection prevention and control of epidemic and pandemic-prone acute respiratory diseases in health care created by WHO in 2007, to control suspected ARD patient's environment. From interviews conducted in this study, a home-visit nurse recommends that the hospital staff empower home care patients to check and record their basic vital signs (including body temperature, pulse, and respiratory rate recordings). A supervisor nurse suggests that suspected ARD patients should record their body temperature and other symptoms related to ARD twice a day: in the morning and in the evening. The pattern used to monitor and control suspected ARD patients in the novel system is summarized as a flow chart in Figure 2.

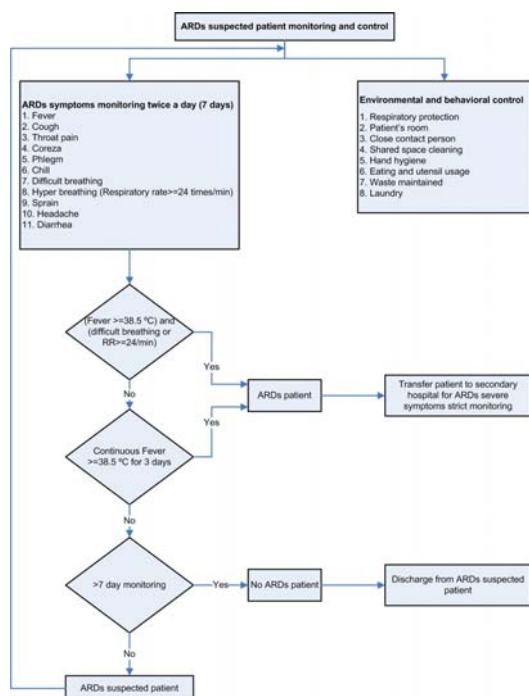


Figure 2 Pattern for monitoring and controlling suspected ARD patients in the system

Secondly, there are two main groups of users who access to the system which are hospital staff (include physicians and nurses) and patients. The requirements of each group of users are listed in the following.

1. Hospital staff

- Early detection by displaying an alarm message when patients' symptoms get worse in ARD criteria
- Display knowledge related to ARDs infection
- Track patients' symptoms and medication records

- Report patients' symptoms and medication in individuals and groups of patients
 - Recommend symptom-based nursing care.
- Patients
 - Direct contact to hospital staff via a mobile phone
 - User identification to secure patient information
 - Support various mobile device platforms.

Data Requirement

This system is directly linked to a hospital information system (HIS), therefore patients' personal data and hospital staff personal data are retrieved from the HIS database. The username and password of each patient is added to HIS to access hospital's online services. The necessary data used to monitor and control suspected ARD patients can be categorized into four groups: hospital staff profile, ARDs suspected patient profile, monitoring and controlling profile, and environment profile.

SYSTEM DESIGN

This study applied rule-based decision support model into the system. This system operates as a decision support system for patients as it provides automatic information support based on a suspected ARD monitoring and controlling pattern. This system consists of 32 rules for making decisions for each patient. Figure 3 shows the decision support rules to create this system.

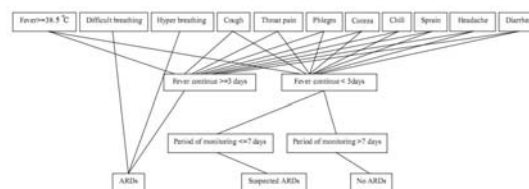


Figure 3 Rule-based decision support in the system

In this phase, this study designs a new system for monitoring and controlling suspected ARD patients at home by using mobile devices through a wireless network connection. The processes of the system are shown in Figure 4. This system is designed by using the Object-Oriented System Analysis and Design based on user requirements. The system use-case diagram, system class diagram, system sequence diagram, activity diagram, and deployment diagram are used to describe the system.

The ARD monitoring and controlling system is a mobile web-based technology and ASP.NET programming language is predominately used to develop this mobile health application [1] [16] [17] [25]. The database management system used in the system is SQL server. There are two

methods for users to access the system depending on the device type: a pocket PC and a mobile phone. The deployment diagram of the system is shown in Figure 5.

The system supports two groups of users: hospital staff (laptop/PC user) and patient (mobile phone user), thus two guidelines are applied to design the user interfaces. The Web Content Accessibility Guidelines (WCAG) 2.0 is used as the guideline to design the user interface of the web application to run on a PC or laptop. The Mobile Web Best Practices 1.0 is the guideline used to design user interfaces of mobile web applications to run on mobile phones.

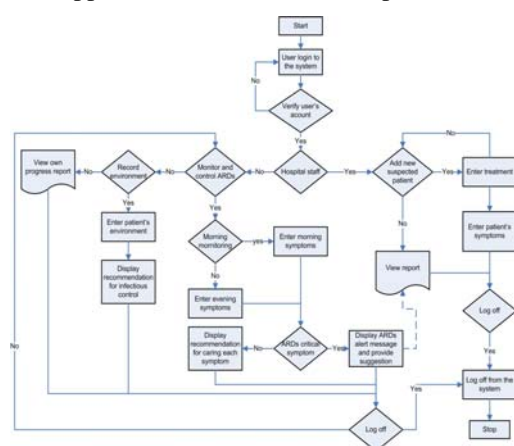


Figure 4 System flow chart of ARDs suspected patients monitoring and control system

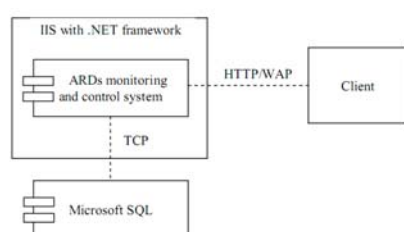


Figure 5 The deployment design of the system

After the hospital staff passed the user verification process, the system categorizes users into two groups: physician and nurse. Each user can operate in the authenticated functions only. A physician is responsible for adding treatments for a new suspected ARD patient (see Figure 6). For a nurse, he/she is responsible for adding information related to monitoring and controlling patient with suspected ARD before patients monitor themselves at home (see Figure 7). Moreover, the system provides two main reports for the hospital staff which are individual and group reports. There are four types of group report in the system: No ARDs, Suspected ARDs, ARDs, and the overall patient status. Figure 8 shows a report of the overall patients which the system calculates in real time. In addition, the system also provides the report to show real-time trend of ARDs of patients in the system (Figure 9).

For mobile users, the system provides three options for a patient after he/she passed the verification process. A patient can record daily symptom, record environment, and view own symptoms summary report. The system will display an alert message when patient's symptom is in the ARDs criteria, or recommendation for caring of each symptom message if patient is still in the suspected ARDs status. The system also displays a recovered ARDs message when a patient was monitored more than seven days without ARDs criteria. Infectious control for patients, a patient has to record patient's environment. If patient lives in the incorrect environment for controlling ARDs spreading, the system will display a message suggesting the suitable environment for home care patient with suspected ARD. The examples of mobile user interfaces for patient are shown in the Figure 10.

Figure 6 Entering a treatment page for physician

Figure 7 Entering ARDs monitoring Information page for nurse



Figure 8 Total patients report page

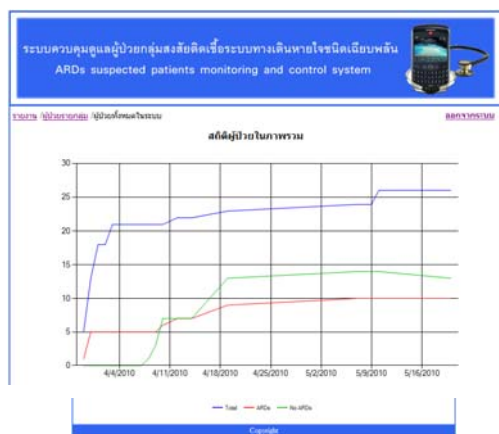


Figure 9 ARDs trend report page



Figure 10a)



Figure 10b)



Figure 10 c)



Figure 10d)



Figure 10e)



Figure 10f)

Figure 10(a-f) The examples of mobile client user interfaces

SYSTEM IMPLEMENTATION AND EVALUATION

The system was implemented on laptop with Windows Vista operating system. ASP.NET programming language was used to create all functions in the system. The MD chart.exe and MS chart_VisualStudioAddOn.exe were installed as the adding components of Visual Web

Developer 2008 Express Edition for providing all chart images in the system. The suspected ARD patient monitoring and controlling system was run on an Ms SQL 2008 server. However, two inconveniences were experienced in the deployment process. Firstly, chart images could not be displayed, and secondly, Ms Access 2007 database could not be accessed. These two problems came about from a mismatch between the server and the development environment. Thus, to display chart images, an image chart control component was added into the web configuration file. For database connection, the MS Access 2007 database was changed to MS Access 2003 version. After the web configuration was edited and changed to MS Access file format, the error messages disappeared.

All functions and user interfaces in the system were tested separately based on system use-cases. Four tests were conducted: namely, integration testing, system testing, multi-platform testing, and acceptance testing. The system passed in all test processes of each testing. To be platform-independent, the system was tested on four mobile operating systems: 1) Symbian (Nokia 6210 Navigator); 2) MS Windows Mobile (HTC P3400i); 3) Rim BlackBerry (BlackBerry Bold 9000, curve 8900); and 4) Apple iPhone (iPhone 3G). All of the devices could fully operate all functions in the system. Text and image navigation were linked to the valid target with correct attached variables. All the mobile devices showed the structure of the display as designed. However, the iPhone 3G showed small displays when it initially accessed every page. To solve this problem, the iPhone 3G's zoom function was adjusted in order to show display screens clearly.

For system evaluation, the system was evaluated in four aspects (information quality, system quality, decision support tool, and the overall of the system) by hospital staff and patients from Royal Thai Marine Corp Health Care Unit. The system evaluation was based on a 3-point rating scale (3=strongly agree, 2=agree, 1=disagree). 20.83% of hospital staff rated the mobile application as "agree" in term of "easy to learn how to use the system" (average score 2.79). 13.64% of patients rated as "agree" in term of "easy to learn how to use the system" (average score 2.86). 36.36% of patients vote as "agree" in term of "ease of use" (average score 2.64). These results maybe come from the difference of user experience especially mobile users; all participants never operated on mobile web application before they used the system to monitor themselves. Moreover, some hospital staffs are familiar with paper-based working style.

CONCLUSION AND RECOMMENDATION

In the past decade, there have been many ARD epidemics, and they have spread across the world because the early symptoms are similar to a simple respiratory tract infection. However, since some suspected ARD patients have good vital signs, and the number of hospital beds for admitting infectious patients is limited, physicians allow home care for them. As a result, this group of patients often spreads their contagious pathogens into the community because they are not monitored and controlled properly. Many mobile applications are applied to health care services, but most of them aim to improve the data collection capability. Some of them aim to keep track of home care patients, but in such cases, the developed mobile application is a platform dependent application. This study successfully developed a platform independent mobile application to keep track of patients, and then used the data to support decision making in order to care for patients with suspected ARDs.

The system was developed using object oriented analysis and design. Two requirements were essential; since the system was developed as a medical application, both domain knowledge in ARDs and user requirements were needed to design the system. The results of interviews with experts and the clinical practice guidelines for AH1N1 were used to create a pattern to monitor and control suspected ARD patients. The use-case diagram, class diagram, sequence diagram, activity diagram, and deployment diagram were designed based on users' requirements. Two main user groups used this system: the hospital staff and patients. The hospital staff accessed the system through a PC or laptop, and the patient group accessed the system through a mobile phone. A patient identification number or HN was used to identify patients in the hospital information system (HIS), and it was used as a key to access the system.

To evaluate the system, the hospital staff used a laptop to operate the system, while patients used a mobile phone. The system was evaluated for information quality, system quality, decision support tools, and the overall satisfaction with the system. Some hospital staff participants in the evaluation process commented on the need for more patient information on ARD symptoms to be provided by the system. For some hospital staff, it was difficult to operate the system due to little computer experience as they usually work in a paper-based format. However, all hospital staff were satisfied with the overall system. Patients commented on the need for more information

related to the care required of ARD symptoms from the system, such as knowledge related to ARD prevention. Some patients had never operated an application on a mobile phone, thus they thought it was not easy to use or learn the system. However, most patients were satisfied with information quality, system quality, decision support tools, and the overall system.

In the future, the system should be developed to support new coming mobile phone, such as 3G and 4G mobile phones. The system should be further tested and evaluated during the epidemic season with a higher number of participants and various user groups, especially mobile clients. This system can be applied to other domains of home care for disease(s) with time-dependent disease pattern (DHF, abnormal fetal movement in pregnancy, and head injuries); they have a suspected status which their symptoms have to observe. The system can be further developed as a network approach for monitoring and controlling epidemics in communities.

For future work, to effectively control epidemics, a Geographic Information System can be integrated into mobile web applications. The patients' landmark location (latitude and longitude) will be new data fields included the database and used to display the epidemic areas (epidemic zone, warning zone, and safe zone). Mobile clients can display the map in terms of map image that are already computed in the server. This study applied a rule-based model as the decision support pattern for suspected ARD patients. However, a future decision support model can integrate a case-based model with a rule-based model to predict the symptoms and provide the proper solutions for patients in each case. In addition, mobile web applications can be developed to connect with portable medical machines, such as blood glucose meters and blood pressure monitors. From the connection, blood pressure and blood glucose data can directly be tracked and sent to the server for real time monitoring of patients with chronic disease.

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TABLETS VS SMARTPHONES: DIFFERENCES IN M-COMMERCE APPLICATION DESIGN

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ABSTRACT

Since the world is moving to the era of mobile Internet computing, the business conducting over the mobile devices became popular. Not only smartphones, but tablet computers also present a variety of new opportunities for business with their technological ability. The research question of this paper is “What are the differences in M-Commerce application between tablet computers and smartphones?”. Three comparison case studies of M-Commerce applications show the differences in the design for tablets and smartphones. The paper contains the introduction, the literature review, the information of current devices in market, the comparisons of M-Commerce applications, the discussions, and conclusions.

Keywords: Mobile Commerce, Mobile Application, Smartphone, Tablet Computer, User Interface.

INTRODUCTION

Era of Mobile Internet Computing

It has been predicted that mobile applications and media tablets are going to bring us to the era of mobile Internet computing as it can be seen in Gartner report [17] that they are the second strategic technology area for 2011, following only the Cloud Computing. While tablets are entering various other markets such as PCs, e-readers, and game handhelds, one-third globally view a tablet as an additive device or a signal for the broader technology market [30].

Tablet Computer

By definition, a tablet computer is a general-purpose computer contained in a single panel [38]. Morgan Stanley research [30] found that, tablets are accelerating the adoption of the mobile Internet in three vital aspects: (1) two-thirds of companies expect to allow tablets on their networks within a year; (2) consumer interest in tablets is even greater outside of the USA; and (3) the users are moving beyond web surfing, e-mail, games, video, and applications to content creation. Tablets are additive to the broader computing market.

Smartphone

A smartphone is a cellular telephone with built-in applications and Internet access.

Smartphones provide digital voice services as well as text messaging, e-mail, web browsing, video cameras, MP3 player, video viewing, and often, video calling [37]. It can be said that it is the product of convergence of regular mobile phone and personal digital assistant (PDA). The key drivers for its adoption are convenience, ease-of-use, security, privacy, and reliability [12].

Research question

Because most of the tablets and smartphones use quite similar operating systems, for example, Apple iPad and Apple iPhone use iOS, etc., and both of them are mobile devices that can be used for mobile commerce, this research came up with the main research question, what are the differences in Mobile Commerce application design for tablet computers and smartphones?

LITERATURE REVIEW

The emergence of broadband wireless infrastructure, through third-generation (3G) wireless connectivity and wireless LANs has broadened aspiration for delivering multiple types of mobile services [41]. There are many researches focusing on mobile commerce. This research reviewed some mobile commerce related technologies such as location based services, mobile advertising, and user interface design. As the trustworthiness is the important element of mobile commerce, it is reviewed in this part also. And finally, the Apple Mail application is selected to show the difference between its tablet computer version and the smartphone version.

Mobile Commerce

The main drivers of smartphones that enable convenient and secure mobile commerce services are electronic wallet application, electronic payment application, 3G Internet broadband access, high computing and communication performance, multimedia contents, etc. [12] There is a limited number of researches about mobile commerce specific on tablet computers, however, since most tablet computers apply the similar technology as smartphones, especially the operating system, all of the drivers are assumed to cover the mobile commerce on tablet computer also. There are many mobile commerce applications published in various mobile portals, which serve for each

platform, such as Android Market (for Android), App Catalog (for webOS), App Store (for iOS), App World (for BlackBerry OS and BlackBerry Tablet OS), Ovi Store (for Symbian), Windows Phone Marketplace (for Windows Phone), and other third party portals such as Amazon AppStore (for Android), etc. When developing mobile commerce applications, attention is recommended to the usefulness and the navigation [36].

Location Based Services

Location plays a key role in determining the type and nature of human activity [41]. Location Based Services are services enhanced with and depend on information about a mobile station's position [60]. Foursquare is an example of the location based marketing. Shopkick and Groupon are examples of location based shopping business [57]. One major type of consumer demands relates to information about location and navigation; the second type is related to usable, personalized information delivered at the point of need; and the third type is the niche consumer applications [41]. Some critical success factors for the adoption of the LBS are identified as the protection of mobile user privacy, easiness of usage, and non-intrusive way of location based service operation [60].

Mobile Advertising

Mobile advertising is an integral part of mobile commerce [60]. There are many types of mobile advertising such as Banner: a graphic or animation banner which is the attractive click button; iAd: an interactive advertisement on iOS platform; Branded Apps: an advertisement whose targets are brand awareness or customer engagement; Mobile Display Advertising; Mobile Search Advertising; Advertisement during the idle screen, etc. [40].

User Interface Design

Design is a process that turns a brief or requirement into a finished product or design solution [2]. User Interface Design is very important and should be considered since the start period of application development. Interface design helps in increasing number of user adoption to the application. Because of the universal interface design for mobile devices, it facilitates user adoption for mobile commerce. It can be adopted by anyone regardless of the demographic differences [43]. Grid system is suggested to manage layout of e-Commerce design [27]. The design process seeks to generate a number of possible solutions and utilizes various techniques or mechanisms to think outside the box in the pursuit of creative or

innovative solutions [2], as many applications succeeded. Apple iPad is the first tablet computer runs on mobile operating system. According to the survey of YouGov [62], even though the largest group of the Apple iPad owners is between 25-34 years old, but the owners that are older than 45 years old (39%) are also not a small portion. Thus, we should also consider about the older adult users. On small displays, text sizes can indeed how well information is remembered. The users should be able to modify the displayed text size to minimize scrolling whenever possible. It is suggested that the option to adjust the text size should be available through adaptive zooming or navigation behaviors [52]. Fisk et al. [16] suggested that the use of attention-grabbling techniques should be minimized. The screens display with many different elements in a variety of attention-catching formats such as flashing and scrolling text and images in the periphery, are problematic for older adults trying to read text background, and text less able to ignore distractions. It is recommended that a display with a realistic background, and text is larger than 18-point font avoiding colored text, is preferred over the other combination of design variables [52]. At the perceptual level, object features such as salience and color can catch attention [56]. Bartram et al. [10] found that motion has several advantages as a notification mechanism. It is significantly better than static screen. The users can detect moving objects more than the peripheral targets. And the animated banners and popping images are not comfortable visual elements on a screen. Other than the Rayport and Jaworski [42]'s 7C for e-Commerce: Context, Content, Community, Communication, Collaboration, Connection, and Commerce; Lee and Benbasat [28] identified 2 new elements: Mobile setting and Mobile device constrains; as a framework for mobile commerce interfaces. Mobile setting is described as diverse shopping environments in term of time, place, and context, which often involves distraction or peripheral tasks, limiting user's attention. And the mobile device constraints are about to become portable, and employ fewer resources. Moreover, Oinas-kukkonen [36] mentioned that while usefulness is mainly a strategic matter, the navigation is a matter of systems design. And Chan et al. [11] mentioned the problems of design mobile commerce applications that should be aware as the long downloads and broken connection; vertical and horizontal scrolling; information overload, depth of site structure, and search issue.

Trustworthiness

Since trust is seen as a highly valuable element

of business relationships [14], it should be concern in mobile commerce. Egger [14] mentioned three principles: (1) Trustworthiness can be communicated before customers have accessed the web site (Branding); (2) Trustworthiness can be communicated during the online interaction (User Interface and User Experience); and (3) Trustworthiness can be communicated after the online interaction (Customer service and fulfillment). The affective design of e-Commerce user interface must be placed in the wider context of user interface and customer experience strategies.

Example application: Apple Mail

It can be understood some differences between application for tablet computer and smartphone from the example of Apple Mail application. Apple Mail is an STMP-POP3-IMAP-Protocol e-mail application, developed by Apple Inc., included in Mac OS X (for Apple computers) and iOS (for Apple iPad and Apple iPhone). Apple [5] mentioned about the differences between Mail in iPad and iPhone as the aspect of different users experiences of each device. Mail of iPhone is designed to help mobile users handle their e-mail while they are standing in line or walking to a meeting, while Mail on iPad is efficient enough for people to use in the go, but its rich experience also encourages more in-depth use. The vital differences of Mail in iPad are expanded support for device orientations; increased focus on message content; a flatter hierarchy; reduced full-screen transitions; and realistic messages.

CURRENT TABLET COMPUTERS AND SMARTPHONES

Devices in market

This research surveyed the current available tablet computers and smartphones in the market regardless the region. The releasing dates of the devices are during April 2010 – July 2011 (See Table 1 & 2 in the Appendices). The research found that the tablet computers have various display sizes from 5 to 12.1 inch diagonally and resolution from 800x480 to pixels, while 3.2 to 4.5 inch display size with 480x360 to 960x640 resolution pixels are available in the smartphone category. The display screen of tablet computers is averagely larger than smartphone by 2 times. From this point, it can be assumed that the users can enjoy richer information, larger area of touch screen (for the purpose of typing, writing, drawing, etc.), and more graphically contents on the tablet computers.

COMPARISON OF M-COMMERCE APPLICATIONS

Case studies

In this research, the author selected three cases in the mobile commerce applications based on the condition of the same developer companies; and they are available on both tablet computer and smartphone. The case studies consist of Showcase and Amazon JP; Rakuten Ichiba Ranking and Rakuten Ichiba; and eBay for iPad and eBay Mobile. The first pair can represent the international applications that are localized to the local users. The second pair represents the local applications. And the third pair represents the international application. In addition, they were mentioned in many researches [3, 4, 15, 20, 56, 59]. All of them are the free iOS mobile application available in Apple App Store in Japan. The study was conducted on Apple iPad 3G/WiFi 32 GB for the tablet's applications and Apple iPhone 4 16 GB for the smartphone's applications in Japan.

Showcase VS Amazon JP

They are developed AMZN Mobile LLC. They provide the secure environment e-Commerce environment as its PC site, Amazon.co.jp. The user interface of Showcase and Amazon are shown in Fig. 1 and 2, respectively.

Showcase. An Amazon's Windowshop application is named in Japanese language as Showcase. It is the first ranked application of Top Free Lifestyle application in the App Store Japan, with 4 stars voted (on July 25, 2011). Amazon promoted it as "Discover" a new online shopping way [8]. The user interface is shown in Japanese. There are top bar menu providing Home button, Category button, Search box, Menu button, and Cart button. The users can find the content by scrolling vertically in the content area. The categories can be changed by scrolling horizontally. Amazon member can purchase and add items into the cart, and buy them. The product page is a window appears over the previous screen with the closed button. The most related products stay as the option for the users to select in the vertical axis. The product page shows the product name and zoom-able photos. The left side menu consists of image, description, review and other 12 recommended products that the person who bought this product also bought.

Amazon JP. It is the seventh ranked application of Top Free Lifestyle application in the App Store Japan, with 2.5 stars voted (on July 25, 2011). It is fixed portrait interface, shown in Japanese. The bottom area of the screen provides

5 icons: Top, Search, Cart, Wish List, and Others. In the others, there are Recommended products, Photo search, Wish list search, Amazon point, Account service, Help, Fashion information, and Contact customer services. The top page changes to 3 recommended products according to the user's shopping history. More 50 recommended products can be found by scrolling vertically in the recommended product page. The information and sub-information in the product page consists of (1) photo: zoomed photo; (2) name & price: description; (3) number of other retailers sell new/used products; (4) customer review: comments; (5) recommended products which the person who bought this product also bought: 25 products; (6) Buy button; (7) Put into cart; and (8) Insert to wish list. All the steps can be easily finished by using only one hand.

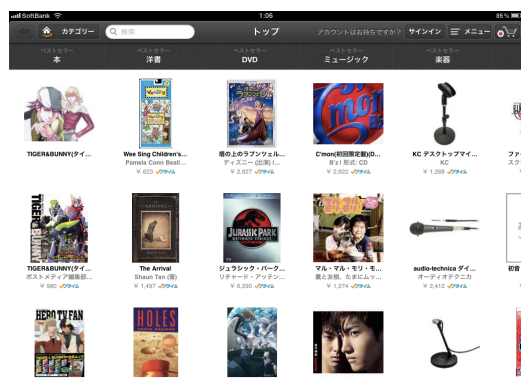


Fig. 1 Showcase user interface (on iPad)



Fig. 2 Amazon JP user interface (on iPhone)

Rakuten Ichiba Ranking VS Rakuten Ichiba

Rakuten, Inc., the biggest online shopping mall in Japan, developed many Japanese mobile applications such as Rakuten Ichiba, Rakuten Books, Rakuten Recipe, Rakuten GORA (Photo Gallery), Rakuten Infoseek News, and Rakuten Blog. The user interface of Rakuten Ichiba Ranking and Rakuten Ichiba are shown in Fig. 3 and 4, respectively.

Rakuten Ichiba Ranking. It is the eighth ranked

Top Free Lifestyle application in App Store Japan, with 2.5 stars voted (on July 25, 2011). Ichiba means Market in Japanese. The user interface is shown in Japanese. On the interface, there are three columns with five rows in the portrait position and 4x4 in the landscape position. Each column is independent movable. The columns are the categories of the products except the first and the second columns (Rakuten Staff Recommend and Top Rank). The row is arranged by ranking. Each column contains 100 products.

Rakuten Ichiba. It is the seventh ranked Top Free Lifestyle application in App Store Japan, with 3 stars voted (on July 25, 2011). It is a fixed portrait interface, shown in Japanese. It allows taking a photo of product barcode to find it in Rakuten market. In the top page, there are other special menus such as Search box, Barcode function, Favorite, Time sale, etc. The bottom menu consists of Home, Search, Ranking, Cart, Others (Favorite bookmark, My item, Help, Setting, Share, Member service, Group service, App service, etc.). The product page shows the product name, price, photo, detail, review, share function (to twitter, facebook, and mixi), and reviews.

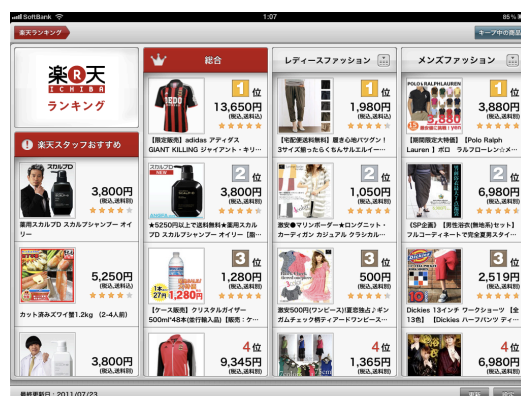


Fig. 3 Rakuten Ichiba Ranking user interface (on iPad)



Fig. 4 Rakuten Ichiba user interface (on iPhone)

eBay for iPad VS eBay Mobile

They are developed by eBay Inc. They are online auction and shopping applications. The user interface of eBay for iPad and eBay Mobile are shown in Fig. 5 and 6, respectively.

eBay for iPad. It is 3 stars voted (on July 25, 2011). It is rotatable to both portrait and landscape seamlessly. The interface is shown in English. It is different from the previous applications for the home page, which provides eBay Deals in the format of only one row in landscape and two rows in portrait. The users can view and scroll independently each row. After browsing into category and sub-category, the catalog shows on screen, initially, sorted by best match.

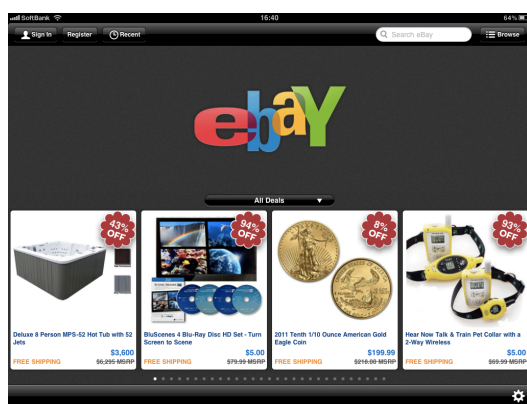


Fig. 5 eBay for iPad user interface (on iPad)

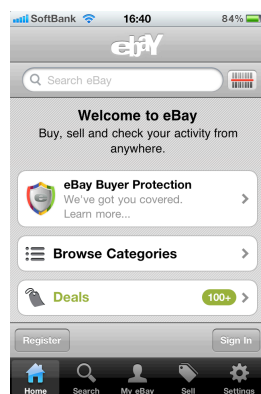


Fig. 6 eBay Mobile user interface (on iPhone)

eBay Mobile. It is 3.5 stars voted (on July 25, 2011). It is fixed portrait interface, shown in English. At home page, the upper part has search box and barcode function; the middle area contains eBay Buyer Protection, Browse categories, Deals Register button, and Sign In button; the bottom menu bar consists of Home, Search, My eBay, Sell, and Setting. In the product page, there are product name, zoom-able photos, description, time left (for auction), buy it now price, condition, location, shipping fee, ship-to location, Buy It Now button, Payment

method, Seller, Category, Item code, Share this item button (to Facebook, Twitter, Email) and Sell button.

DISCUSSIONS AND CONCLUSIONS

Discussions

While ICT evolves very fast, the potential of mobile applications should not be considered only with the limitations of the current wireless devices in mind. The general design principles are needed instead of technology-specific ones [36]. As the visual chaos is a usability barrier and obviously affected the aesthetic quality [27], the simple design is preferred. The developers should pay attention to text alignment, layout, font size, and color. As all of our selected applications' design, they provide simple user interface with easy-to-read content, and mostly white color background. For the age issue, it is not convenient to design for both age range sets, older and younger users, because there are high levels of the satisfaction. Therefore, the application should be targeted to a specific population. However, in order to make it suitable for everyone, the developer should design the easy-to-use user interface, and the best solution is the customization option [52], for example, the ability to zoom in the photo or text, etc.

Recommendation for Tablets

For the tablet computers, the application is displayed on the large area screen; however, the space should be designed effectively. To beware of confusion, the developer should design the application simple and reliable. Instead of all-in-one screen, the elements should be put only when they are needed. Using grid view seems to be a nice alternative to let the users see the whole picture before focusing on each detail. Nevertheless, the design and relationship setting for the grid arrangement should be careful, especially, for the initial users. As the benefit of large area, showing as catalog style is also possible. Designing the application with both portrait and landscape interface is suitable for the tablet computers, but it should work seamlessly.

Recommendation for Smartphones

For the smartphones, as the nature of the devices, the mobile commerce applications tend to display less image or photos than the tablet computer's, but focusing more on text. The category can be shown by the slide menu or drop down list that let the users tap until they can find the products. The detail with photo may be shown in the final product page. The application should not require the users to remember items

[11]. Therefore, the design should be focused on text and hierarchy (the number of touch-on-screen to finish the transaction) since one of the usage aspects is doing transaction while handling other activities. However, since good organization of information is critical for achieving greater efficiency, a flat hierarchy is recommended [11]. The portrait seems to be suitable for mobile commerce application of smartphones.

In addition, there are other issues to be concerned as the current constraints for the effective interface design such as the limited connectivity and bandwidth in some areas, diverse devices and operating systems, dominance of proprietary tools and languages, and the absent of common standards for mobile application development [43]. Since location can determine consumers' information needs and their product and service choices [41], the location-based services might be applied into the mobile commerce application if suitable. Finally, the developers are challenged to design the applications that accommodate both expert and novice users [11]. As one of the software development steps, after designing the application, the prototype should be tested by the users before launching.

Limitations and future works

There are presences of several limitations in this paper. Firstly, the comparisons are conducted on only one operating system, the iOS. Secondly, despite several mobile commerce applications are available, the particular applications are selected as the case studies. As further studies, other platforms, devices, and applications can be applied in the study. And the validation should be applied in the analysis.

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APPENDICES

Tablet 1: Display of tablet computers

OS/Device	Display (inch)	Resolution (px)
1. iOS		
1.1 iPad	9.7	1024x768
1.2 iPad 2	9.7	1024x768

2. Android		
2.1 Vega	7	1024x600
2.2 EeePad Transformer	10.1	1028x800
2.3 Streak 5	5	800x480
2.4 EVO View 4G	7	1024x600
2.5 Flyer	7	1024x600
2.6 Optimus Pad	8.9	1280x768
2.7 Xoom	10.1	1280x800
2.8 Adam Tablet	10.1	1024x600
2.9 Galaxy Tab	7	1024x600
2.10 Galaxy Tab 10.1	10.1	1280x800
2.11 gTablet	10.1	1024x600
3. BlackBerry Tablet OS		
3.1 PlayBook	7	1024x600
4. webOS		
4.1 TouchPad	9.7	1024x768
5. Windows		
5.1 Eee Slate	12.1	1280x800

Source: [1, 6, 13, 21, 24, 29, 33, 35, 44, 50, 51, 53, 61]

Table 2: Display of smartphones

OS/Device	Display (inch)	Resolution (px)
1. iOS		
1.1 iPhone 4	3.5	960x640
2. Android		
2.1 Nexus S 4G	4	800x480
2.2 Droid Incredible	3.7	800x480
2.3 Evo 3D	4.3	960x540
2.4 Optimus 2X	4	800x480
2.5 Atrix 4G	4	960x540
2.6 Droid 2	3.7	854x480
2.7 Galaxy S	4	800x480
2.8 Infuse 4G	4.5	800x480
2.9 Galapagos 0003SH	3.8	800x480
2.10 Xperia Play	4	640x480
2.11 myTouch 4G	3.7	800x480
3. BlackBerry OS		
3.1 Torch 9800	3.2	480x360
3.2 Bold 9650	3.2	480x360
4. webOS		
4.1 Pre 2	3.1	480x320
5. Symbian		
5.1 E7	4	640x360
6. Windows Phone		
6.1 Venue Pro	4.1	800x480
6.2 Focus	4	800x480
6.3 Quantum	3.5	800x480

Source: [7, 9, 18, 19, 22, 23, 25, 26, 31, 32, 34, 39, 45, 46, 47, 48, 49, 54, 55, 58]

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UNDERSTANDING USER INTENTIONS TO DOWNLOAD GAMES ON MOBILE PHONES: TECHNOLOGY ADOPTION AND USER DEMOGRAPHIC PERSPECTIVE

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ABSTRACT

In recent years, various forms of mobile technology based hedonic services are emerging. As this is a relatively new and unexplored practice which seems to be more popular among young generation, there is a need to examine its acceptance among student community who use mobile phones for many purposes including entertainment. We thus report a study which examines a segment of the Australian students' acceptance of downloading games on their mobile phones using Technology Adoption Model as a theoretical lens. We further highlight the role of student demographic characteristics on their perceptions. The implications of our findings are discussed.

Keywords: mobile technology, hedonic context, games downloading, acceptance, demographics

MOTIVATIONS FOR THE RESEARCH

During the past few years, there has been a sharp rise in the use of mobile technology based applications in support of hedonic activities. According to industry sources, the revenue potential of wireless hedonic technologies is enormous. Gartner, Inc. [8] estimates that the worldwide mobile game end-user revenue will surpass US\$5.6 billion in 2010. Jung et al. [12] thus rightly point out that the mobile service providers continue to fight for market share by offering new services supporting various hedonic activities (e.g. mobile tv). Mobile devices are ubiquitous and are used for several purposes such as personal management, work, and leisure activities. At the same time, several scholars highlight that some unique barriers associated with mobile devices (e.g. small screen size) may hinder individuals from using mobile technologies to seek entertainment. These contradicting viewpoints about the use of mobile technologies for hedonic activities make these technologies an interesting topic for examining their acceptance by individuals. Hence, further research attention is needed to focus on consumer acceptance of the use of mobile technologies supporting their hedonic games downloading activities. Another

motivation emerges from the fact that existing literature about the influence of demographic characteristics on individuals' intentions to use mobile technology for hedonic applications is still at infancy due to the emerging nature of mobile technology. Therefore, it is essential to examine the role of demographic characteristics from consumer marketing perspective. Motivated by these two concerns, we have therefore initiated this exploratory study among a segment of student population at a large Australian university to understand students' intentions to use mobile technologies to engage in hedonic activities using Technology Adoption Model (TAM) developed by Davis [5] as an appropriate theoretical lens. We further seek to examine the association of two key demographic characteristics (age and gender) with the students' perceptions about engaging in hedonic behaviours using mobile technologies. In particular, we have chosen downloading games on students' mobile phones as the appropriate context to address our research concerns. Downloading games represents an instance of hedonic activity and is a relatively new phenomenon for which limited studies are reported in scholarly literature. Hence, the use of TAM to games downloading context will help in clarifying its applicability by highlighting TAM's ability to explain mobile hedonic technology acceptance by individuals which has not been adequately explored in the past.

THEORETICAL BACKGROUND

Hedonic activities: The word „hedone“ is traced to its roots, meaning pleasure – akin to sweet [26]. Seligman [25] describes hedonic activities as those for which individuals engaging in such activities (e.g. leisure) experience pleasant feelings. Many technologies qualify for hedonic purposes. In recent years, mobile service operators are introducing various mobile services (e.g. ringtones) for satisfying the hedonic needs of their subscribers as mobile technologies and associated services are also used to meet hedonic [16]. According to Liu and Li [18], playing games on mobile phones represents one of the most promising and profitable services.

Technology acceptance: Acceptance of

technologies by individuals has long been regarded as a topic of immense significance to the IT and e-commerce adoption scholars. Many frameworks are reported; however among them TAM is known to be quite robust and influential in explaining technology acceptance by individuals [10] [23]. Even though TAM has been primarily applied to a wide range of productivity enhancement technologies, in recent years some scholars have also applied it for hedonic context [33] [21]. TAM provides an explanation of factors determining general computer use for organisational context. It encompasses the impact of external factors (e.g. demographic characteristics) on internal beliefs, attitudes and intention [6]. The two constructs fundamental to the original model are perceived usefulness and perceived ease of use [12]. Perceived usefulness is generally defined as “the prospective user’s subjective probability that using a specific application system will increase his or her job performance within an organisational context” [6]. However, for hedonic context, the definition of perceived usefulness changes from utilitarian perspective to satisfying emotional desires perspective [14]. This view is also supported by Jung et al. [12]. Perceived ease of use refers to “the degree to which a person believes that using a particular system would be free of effort” [5]. TAM also posits that computer usage (behaviour) is determined by behaviour intention, which is represented as the weighted sum of the person’s attitude towards using the system and perceived usefulness. The relationship between attitude and intention implies that people form intentions to perform certain behaviour when they have positive feelings towards it. Although subjective norm was not included as a predictor of intention in the original model, it was later included in TAM to account for mandatory system use [32]. It also suggests the influence of external variables (e.g. demographic characteristics) on both ease of use and usefulness. Although intended for productivity-oriented technologies, TAM has been applied to explain the acceptance of mobile technologies intended for hedonic situations. However, most of these studies were conducted in either Asian countries (e.g. China, Taiwan and South Korea) or some European nations context (e.g. Spain and Norway), and no studies are reported for Australia. Moreover, the dependent variable seems to be either attitudes or intentions [1][11][12] [18] [22]. Furthermore, conflicting evidence is found about the role of perceived usefulness and perceived ease of use.

Demographic Characteristics and Use of Hedonic Technologies: There exists scant

literature on how demographic characteristics of consumers may influence their use of mobile technologies. We therefore review the broader IT and e-commerce literatures and find inconclusive evidence about the role of gender and age on an individual’s use of online and innovative technologies. For example, from the theoretical perspective, the potential influence of demographic characteristics on a person’s attitudes towards performing a given behaviour has been acknowledged by TAM [6] and Theory of Reasoned Action [7]. In TAM [5], several external variables were incorporated which may influence user belief structure towards perceived ease of use and usefulness. Some of these variables include users’ demographic characteristics and situational context. The TRA [7] model claims that attitude (towards a behavior), subjective norm, and intention are the prime determinants of behavior. It further does not deny the possibility that demographic factors will also have a relationship with behavior. However, empirical e-commerce literature provides mixed support about the role of demographic factors mentioned in TAM and TRA. For example, scholars like Schofield and Davidson [24], Nachmias et al [20], Stone et al. [27], Teo et al. [28], and Zhang [35] reported that individual characteristics of users are related to the use of various types of IT systems (including the Internet) for both personal and organisational contexts. In contrast, such scholars as Anandarajan et al. [2] and Konradt et al. [17] did not find significant relationship between users’ demographic characteristics and their use of Internet-enabled IT systems. Thus, for the mobile technology based applications intended for hedonic context, the role of demographic characteristics needs further research attention.

Gaps in the Literature: We acknowledge that works of various scholars [1][11][12][18][22] make an important contribution towards establishing the applicability of TAM for using mobile technologies for hedonic context. Despite such contribution, little work has yet been reported in the literature to demonstrate how TAM applies to downloading games on mobile phones context. Moreover, past studies of the applicability of TAM has focused on some Asian and European student population, and to the best of our knowledge, no empirical work involving TAM for mobile technologies supporting hedonic activities has yet been reported for the Australian student context. Hence, further studies are needed.

RESEARCH MODEL AND HYPOTHESIS DEVELOPMENT

By including the key constructs of TAM, we

now propose a research model (Figure 2) and derive several hypotheses. Each hypothesis is briefly described below.

Gender: There is evidence in the broader IT literature that is indicative of the existence of a difference in individuals' dispositions towards various types of information technologies. For example, Venkatesh and Morris [31] observed that attitudes of males are more dominated by their perceptions of portal's usefulness. In contrast, attitudes of females are often guided by their attitudinal perceptions towards portal's ease of use. Furthermore, some scholars [9] indicated that females are more likely to be anxious about using IT systems than their male counterparts depending on the degree of complexity involved in it. According to Vallerand [30], males tend to be more confident with the execution of complex tasks using IT systems than their female counterparts. For a hedonic application such as downloading

Age: The broader IT literature provides some evidence and arguments in support of age playing a role in forming an individual's belief and attitudes towards his/her perceived usefulness, ease of use and attitudes for IT systems use. For example, older people may be more likely to form an attitude for using an IT application based on their perceptions of the degree of effortlessness in using that particular application [31]. In other words, older people tend to form positive attitudes towards an IT system when usage of those applications does not demand considerable effort on their part. Another argument is that perceived usefulness of an IT application may differ between young and more matured people because older people may take longer time to learn new ways of doing things as they have formed habits over a period of time [30]. For a hedonic application such as downloading games on mobile phones, we argue that when mobile technologies are perceived hard to use and involve greater learning requirements and the degree of hedonic satisfaction to be derived from the use of such technologies is influenced by how smartly and comfortably such applications can be used, then a significant difference in the perceived usefulness, ease of use and attitudes of students towards downloading games on their mobile phones can be expected. As a result, the following hypotheses are proposed:

H2a: There is a significant difference in perceived usefulness of downloading games between young and more matured students

H2b: There is a significant difference in perceived ease of use associated with downloading games between young and

games on mobile phones, we argue that when mobile technologies are perceived complex and the degree of hedonic utility to be derived from the use of such technologies is not obvious, then a significant difference in the perceived usefulness, ease of use and attitudes of students towards downloading games on their mobile phones can be expected. As a result, the following hypotheses are proposed:

H1a: There is a significant difference in perceived usefulness of downloading games between male and female students

H1b: There is a significant difference in perceived ease of use associated with downloading games between male and female students

H1c: There is a significant difference in attitudes towards downloading games between male and female students

more matured students

H2a: There is a significant difference in attitudes towards downloading games between young and more matured students

Perceived usefulness of downloading games: Perceived usefulness is defined as the extent to which individuals feel that a certain technology would enhance their performance, and would help them in achieving certain goals [5]. For the mobile games downloading context, perceived usefulness describes how easily and efficiently does downloading games on mobile phone enables the users to satisfy their urge of playing games. Usefulness represents extrinsic motivation, that is motivation based on goal achievement [32]. Given that downloading games is a hedonic activity, usefulness is concerned with providing a better channel for entertaining individuals who play games. Hence, the following hypothesis is proposed:

H3: Perceived usefulness of downloading games is positively related to students' attitude towards downloading games on mobile phone.

Perceived ease of use associated with downloading games: According to Davis [5], the term "perceived ease of use" refers to the extent to which an individual believes that a particular technology would be easy to understand and use [5]. For the downloading games on mobile phones context, it can be argued that perceived ease of use relates to the easiness of learning how to play games on mobile phone, downloading them and becoming skillful at playing games. Easiness of mobile games is a subjective decision, as it is directly affected by users' experience in downloading games. It can be easy for some

and difficult for beginners. It also depends on self-efficacy and mobile aptitude of the users, hence it can be said that when the downloading task is easy, it positively impacts attitude. Therefore, the following hypothesis is proposed:

H4: Perceived ease of use associated with downloading is positively related to students' attitude toward downloading games.

Attitude towards downloading games: Davis [5] defines attitudes as "the affect that one feels for or against some object or behavior". Ajzen and Fishbein [7] distinguish between two types of attitude: a) attitude towards object (e.g. mobile phone, computers, PSP etc), and b) attitude towards behavior (e.g. downloading games online gaming, chatting etc). For our research context, attitude measures the behavioral dispositions of the users' intention in downloading games on mobile phone. This is affected by a person's belief of usefulness and ease of use of mobile games download services, and the game itself. Hence, the following hypothesis is proposed:

H5: Students' attitude towards downloading games is positively related to their

intentions to download games.

RESEARCH APPROACH

Justification of survey approach: Our research is exploratory in nature because the applicability of TAM to hedonic contexts involving mobile technologies in Australia has not been examined before. Hence, based on the suggestions of Yin [34], an exploratory survey approach was considered appropriate.

Survey population and sample: Participants of the survey are students from a large Australian university. They were chosen at random basis at public meeting places around university where large number of students gather (e.g. cafes, library). A total of 300 questionnaires were distributed and 209 completed responses were obtained resulting in 69.5% which is quite satisfactory. Data obtained from the completed responses were analysed using SPSS version 19.

Operationalisation of research variables: The variables used in the research model were operationalised using a number of items adapted from the established literature sources. A high level summary is shown in Table 1.

Table 1: Items used to measure research variables

Construct	No of items	Literature Sources
Perceived ease of use (PEOU)	4	Nyseven et al (2005), Hsu et al (2004), Kloppe, et al (2004).
Perceived usefulness (PU)	3	Nyseven et al (2005), Hsu et al (2004).
Attitude towards downloading games on mobile phones (AT)	4	Nyseven et al (2005)
Behavioural intentions (Dependent variable)	1	Turel et al, (2007)

Survey instrument design: Drawing on Table 1, an initial theory driven survey instrument was developed which included 12 items. According to research gurus, a research instrument should be refined before administering it among the target population in order to enhance instrument reliability and validity [34]. In keeping with this view, the initial survey instrument was evaluated through a three stage qualitative process: a) evaluation by domain experts [15], b) item factor association, and c) pilot test. At the first stage, the initial survey instrument was circulated to four domain experts who were requested to comment on the comprehensiveness, accuracy, and readability of the items included in the instrument. Based on their suggestions, several items were rephrased. At the second stage, the revised

instrument was given to five participants including two PhD students and three undergraduate students. Based on their evaluations, several amendments were incorporated. Finally, a pilot test was conducted among randomly selected ten students to identify any ambiguities still present in the survey instrument which in turn enhances the face validity of the instrument. The analysis of the feedback from these students enabled us to further refine the instrument. Following that, the revised survey instrument was distributed among a randomly selected sample of 300 students at a large Australian university.

Instrument validation: In order to improve the reliability of the survey instrument, we have first applied the suggestions of Churchill [4] to purify the items included in the instrument by drawing on the responses received from the

survey. Out of 11 items used for measuring the perceived usefulness, perceived ease of use and attitude (Table 1), we have removed 2 items for which “corrected-item-total” correlation was

less than 0.30. The results of reliability analysis are displayed in Table 2.

Table 2: Item total statistics

Item	Item Description	Corrected item-total correlation	Chronbach's alpha value (overall)
PEOU2	Learning to play games on my mobile phone is not difficult for me	.391	.857
PEOU3	Games on my mobile phone are easy to play	.430	
PEOU4	My interaction with mobile games downloading is clear	.427	
PU1	Downloading games on my mobile phone enables me to accomplish the task of playing games more efficiently	.346	
PU3	Overall, I find downloading games on my mobile phone is useful	.618	
AT1	Indicate your degree of feelings concerning the use of mobile phone for downloading games is: good .	.638	
AT2	Indicate your degree of feelings concerning the use of mobile phone for downloading games is: valuable	.504	
AT3	Indicate your degree of feelings concerning the use of mobile phone for downloading games is: desirable	.629	
AT4	Indicate your degree of feelings concerning the use of mobile phone for downloading games is: enjoyable	.661	

We have then computed the reliability (Chronbach's alpha value) of the survey instrument involving the remaining 9 items which was found to be 0.857 and is quite satisfactory. Next, we have applied an exploratory factor analysis to determine whether the remaining 9 items truly represent the constructs of TAM. The results of the factor analysis are shown in Table 3 and Table 4 which confirm that these 9 items indeed correspond to three constructs (e.g. PEOU, PU and attitude).

Table 3: Factor loadings of retained items

Items	Factors		
	Factor 1 (Attitude)	Factor 2 (PEOU)	Factor 3 (PU)
PEOU2		.810	
PEOU3		.844	
PEOU4		.509	
PU1			.886
PU3			.458
AT1	.799		
AT2	.809		
AT3	.808		
AT4	.682		

Table 4: results of factor analysis

Statistics	Factor 1 (AT)	Factor 2 (PEOU)	Factor 3 (PU)
Eigen values	3.68	1.44	1.03
Variance by individual dimension	40.9	16.07	11.14
Cumulative variance	40.9	56.98	68.12
Kaiser-Meyer-Olkin Measures of Sampling Adequacy = .816			
Bartlett's Test of Sphericity (Approx.)			
Chi-Square = 591.88; df = 36; Sig.(p) = .000			

EMPIRICAL FINDINGS AND DISCUSSION

Demographic Characteristics: A total of 209 completed questionnaires were received. Out of that, 102 students reported to have downloaded games on their mobile phones. This indicates that 48.08% of students have experience with mobile games downloading service. Out of 209 participants, 138 are male (66%) and the remaining 71 are female (34%). Hence, a dominance of the male participants is observed. A vast majority of the participants

were young (93.8%) as they belong to age group of 18-25 years. About three-fourths (76.6%) of the respondents are currently enrolled in various undergraduate degree programs, and nearly 24% are enrolled in post graduate degree.

Hypotheses Evaluation: A regression analysis was performed to examine the relationship between perceived usefulness and perceived ease of use with students' attitude towards downloading games on their mobile phones. The results are presented in Table 5. Both

Table 5: Regression analysis results for hypotheses H1 and H2

Model	Unstandardized Coefficients		Standardized Coefficients Beta	t	p-value
	B	Std. Error			
PEOU	.233	.078	.187	2.98	.003*
PU	.520	.071	.458	7.31	.000*
R ² (Adjusted) = 30.4%, F = 46.4, p = .000					

Another round of regression analysis (Table 6) was performed to find the explanatory power of students' attitude towards downloading games on their intentions to download games. The

Table 6: Regression analysis results for hypothesis H3

Model	Unstandardized Coefficients		Standardized Coefficients Beta	t	p-value
	B	Std. Error			
Attitude	.698	.077	.534	9.081	.000*
R ² (Adjusted) = 28.1%, F = 82.47, p = .000					

Several rounds of student t-tests were performed to evaluate the existence of significant differences in students' perceived usefulness, ease of use and attitudes towards downloading games between male and female students as well as between young and matured students. The results are displayed in Table 7 and confirm the lack of any major association between the students' demographic characteristics and their perceptions towards downloading games. On the matter of age, although age was measured into 3 distinct categories (Table 5), we have collapsed age into two categories (i.e. less than 21 years and above 21 years) because out of 209 responses only 13 were above 26 years of age category.

In summary, out of five proposed hypotheses, three (H3, H4 and H5) were empirically supported by our survey findings. Furthermore, perceived usefulness and perceived ease of use jointly explain only 30.4% variations in students' attitudes towards downloading games. Moreover, attitudes explain only 28.1% of variations in their intentions to download games. Hence, overall the constructs used in TAM are significant for explaining students' intentions to download games but the explanatory of TAM is

perceived useful and perceived ease of use were found to significantly explain the variations in students' attitudes towards downloading games. As a result, hypotheses H3 (p = .000) and H4 (p = .003) were supported. However, R² (Adjusted) indicates that these two variables are responsible for explaining about one-third variations in attitudes. The beta values indicate that perceived usefulness is more related to attitude as compared to perceived ease of use.

results confirm that attitude is significantly related to students intentions for downloading games (p = .000) and thus support hypothesis H5.

not very high. These findings are indicative of the possibility that TAM alone cannot fully explain the variation in intentions (for this type of mobile technology used for hedonic context) which in turn calls for more research into integrating other alternative theoretical perspectives with TAM. One possibility is to develop a more comprehensive acceptance model for hedonic context by integrating ideas borrowed from Consumption Value Model (CVM) which was used by Turel [29]. Another important finding is that neither gender nor age of the students was related their perceptions about usefulness, ease of use and attitudes towards downloading games. This observation suggests that at least for this hedonic context demographic characteristics do not have much significance. This is quite different from those reported in the broader IT and e-commerce literature sources which provide mixed findings about the role of demographic characteristics on individuals' attitudes and intentions towards IT acceptance. The lack of significance of demographic characteristics for downloading games has implications for the mobile service providers' marketing programs. Such programs should be designed based on the assumption that the appeal for downloading games has

appeal to consumers regardless of their gender and age orientation.

Table 7: Results of student t-tests

Demographics	Perceived usefulness	Perceived ease of use	attitude
Gender	Male mean: 2.93	Male mean: 3.57	Male mean: 2.86
	Female mean: 3.08	Female mean: 3.55	Female mean: 2.92
	t- value: - 1.41, df = 140.4	t- value: .166, df = 152.1	t- value: - .486, df = 166.8
	p-value: .161	p-value: .868	p-value: .628
	H1a is not supported	H1b is not supported	H1c is not supported
Age	Mean (young): 2.97	Mean (young): 3.51	Mean (young): 2.82
	Mean (mature): 3.0	Mean (mature): 3.64	Mean (mature): 3.01
	t- value: - .254, df = 174.8	t- value: -1.38, df: 169.2	t- value: -1.57, df: 147.8
	p-value: .80	p-value: .168	p-value: .117
	H2a is not supported	H2b is not supported	H2c is not supported

CONCLUSION

Mobile technologies are now growingly used for hedonic purposes. As such, we have reported the findings of an initial exploratory survey among a segment of the Australian university students about their attitudes and intentions for downloading games on mobile phones. We have analysed students' views using TAM. It however seems that although the underlying principles of TAM apply to the games downloading hedonic context, the explanatory ability of TAM to explain the variations in students' intentions to download games is limited. This in turn suggests that future research is still needed to consider the inclusion of factors from other competing theories (e.g. CVM). Furthermore, for downloading games context, students' demographic characteristics were not found to be relevant at all which contradicts the current belief for the productivity oriented technology use by individuals. Further studies should also seek information on a, b and c to better understand how students use and download games on their mobile phones. However, we caution against generalizing our findings because they were drawn from student sample only. Despite this, our findings make contributions to theory by highlighting limited ability of TAM for hedonic context. To practice, knowledge of our findings would mean that mobile services providers can design their marketing campaigns without differentiating the influence of gender and age. Our research although useful is not free from weaknesses. One limitation of our research is that the survey participants are predominantly students currently pursuing their degree. As a result, views from other types of participants were not captured, thereby restricting generalisability of the research findings. Further research studies are thus needed to include different types of respondents (e.g. business people, professionals, trade people) in a survey.

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Adoption Factors for Mobile Financial Services: Laggards and Early Adopters in Low-Income Countries

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ABSTRACT

This paper evaluated low-income countries and identified adoption factors for mobile financial services (MFS) that are not covered by TAM (Technology Acceptance Model). From the literature we identified enabler and bottleneck factors that impact MFS adoption in low-income countries. We analyzed laggard and early adaptor countries to compare the factors. In our conclusion we identified thirteen MFS adoption factors and categorized them in a 2x2 metrics using enablers and bottlenecks vs. exogenous and endogenous. Further, we used the early adopter and laggard countries to understand how the MFS adoption strategy differed between the two groups. Future direction is provided.

Keywords: mobile, financial service, TAM, low-income country, adoption,

Introduction

There are over nine million households, i.e. nearly 20-million people, in the United States [1] and an additional 2.5 billion people around the world [2] that are unbanked or under-banked. The challenges faced by unbanked and under-banked communities in both high- and low-income countries are similar including complex procedures and eligibility norms [3] as well as the need for transformative model instead of additive model [4], [5]. But these challenges/factors differ from the constructs commonly used in TAM (Technology Acceptance Model), which typically focuses on banked individuals with operational access to multiple channels [3]. This study contributes by looking at the enabler and bottleneck factors that uniquely impact the adoption of MFS in unbanked and under-banked communities.

There are over 5.3 billion mobile cellular subscriptions worldwide [6], nearly the same number of people, 5.4 billion, which have access to electricity [7]; compared to the 6.9 billion world population these numbers are 77% and 78%,

respectively. This staggering global adoption rate of mobile phones presents MFS as an attractive alternative for economic inclusion.

Mobile Financial Services (MFS) refers to a set of applications that enable people to use their mobile (cell) phones to manipulate their bank account, store value in an account linked to their handsets, transfer funds, or even access credit or insurance products [8]. The term ‘MFS’ is applied to a range of financial activities that are conducted using mobile devices, such as cellular phones or personal digital assistants [9]. For the purposes of this research MFS is defined as financial services that can be done using mobile technologies without having to be at a physical bank branch, i.e. branchless banking. Financial services include account inquiry, deposits, withdrawals, and transactions. The primary device is mobile or cell phone but other devices including hand held devices, computers, and slates are also means for accessing mobile financial services. MFSs are increasingly being promoted as the way forward for financial transactions [10] and have several advantages to help increase the efficiency and effectiveness of financial transactions and operations.

In this study “unbanked” refers to individuals that do not have any banking account and “under-banked” refers to people that have at least one bank account but with limited volume and value transaction due to lack of access to banking and financial services or due to lack of demand. Unbanked and under-banked individuals have limited (or not at all) access to savings or credit account in the traditional banking system or alternative financial institutions like microfinance, the potential of creating a “branchless banking” for these individuals avails an opportunity to leapfrog to ubiquitous financial services. Unbanked and under-banked individuals cannot afford the cost of formal banking services and infrastructure hence they benefit significantly from innovative mobile financial services like mobile banking and mobile payments [9].

Mobile adoption rate in African countries, our focus in this study, are higher than US and Europe; by 2012 sixty percent of Africa's population is expected to have mobile phones, except four countries including Guinea Bissau, Ethiopia, Mali, and Somalia [11]. While many countries have embraced MFS as a potential for financial inclusion adoption successes vary significantly; Kenya and South Africa are among the early adopters of MFS with recognizable success [12]. On the contrary MFS adoption in the laggard countries Guinea Bissau, Ethiopia, Mali, and Somalia, has not been as successful [11].

Methods

For this study we conduct literature review to identify enabler and bottleneck factors for MFS adoption and categorize them as endogenous or exogenous factors. In our analysis we look at the literature to understand how successful countries handled the adoption factors and learn from their experience. We also look at how countries lagging behind in MFS adoption handled the adoption factors. Furthermore we took a closer look at one of the countries lagging behind in MFS adoption, Ethiopia, and evaluated the specific challenges through a pilot interview with industry experts.

Our interviewee for the pilot test included five bank executives from a large government bank and a senior consultant. The interview was conducted by one of the researchers. All interviewee were male and self-identified their operational knowledge of MFS as good.

Literature review

Several scholars have applied the TAM constructs to Internet and mobile banking including security concerns, lack of awareness, trust, and mobile network quality [13]; [14], [15]; [16], and [5]. As stated before these factors are focused on operations that have adequate access to multiple channels [3]. There is a dearth of knowledge about the MFS adoption factors for unbanked and under-banked individuals. This study contributes to our understanding of factors that enable or become bottleneck for MFS adoption in the unbanked and under-banked communities. We further apply these factors by looking at two early adopters of MFS, Kenya and South Africa, as well as one laggard country in the adoption of MFS, Ethiopia.

Prior research posits several factors that impact MFS adoption. For example, the high cost of opening physical bank branch and low volume of transactions [3] lack of customer service infrastructure & informational deficiencies [17], high cost of financial transaction along with low

penetration [18], absence of MFS use policy, security, trust, presence of regulatory policy environments for telecoms and mobile finance use [19], financial limitation to acquire the technology [11], cost of telecommunication and lack of e-banking use regulatory policies [18]. These factors are summarized in Table 1 and detailed description of the factors is provided in the subsequent paragraphs.

Table 1: Mobile financial services adoption factors in unbanked and under-bank communities

	Exogenous factors	Endogenous factors
Enabler	<ul style="list-style-type: none"> - Complex procedures and eligibility norms - Cost of account maintenance - High borrowing rate - High physical branch cost 	<ul style="list-style-type: none"> - Transformational model approach - "Access to all" principle - Ubiquitous device
Bottle neck	<ul style="list-style-type: none"> - Supporting services - Absence of regulatory policy - Lack of telecom infrastructure 	<ul style="list-style-type: none"> - Lack of customer oriented services - Low transaction volume - Absence of use policy

Enabler—Exogenous: These factors are triggered by the current financial landscape, hence exogenous to MFS, but the factors motivate patrons to consider MFS as an alternative solution, hence enablers of MFS.

- *Complex procedures and eligibility norms of a traditional bank [enabler—exogenous]:* The procedures to open a traditional bank account is complex and has stringent eligibility criteria; often driven by the sensitivity of financial transactions, default liabilities, and attempt to avoid money laundering. However, the procedures and criteria should commensurate with the associated risk. For example, requiring physical presence to open an account puts too much burden on an individual furthest from a bank branch—often the unbanked and under-banked persons. MFS can alleviate these challenges by providing hand-held devices equipped with the ability to provide all necessary identifiers including picture taking and biometric features like fingerprints; this positions MFS as a flexible solution to adopt risk-based account opening [20].

- *Cost of account maintenance [enabler—exogenous]*: The minimum monthly balance an account holder has to maintain to avoid monthly account maintenance fees is as high as \$1,500.00. Many in the unbanked community do not have this level of discretionary funds; as a result their nominal deposit will dwindle due to the monthly fees, in some cases it may prompt account closure. The typical model used in MFS is transaction based; i.e. the account holder is charged a nominal fee only when making transactions.
- *High borrowing rate [enabler—exogenous]*: Unbanked individuals that use non-traditional financial services like “check cashing” or “pay-day-loan” end up paying very high interest rates; in some cases reaching an annual rate of 300%. MFS provide a low-cost and flexible model for the traditional banks, microfinance, and credit unions to reach the unbanked community, hence create an environment where these traditional institutions serve their needs avoiding the high borrowing rate.
- *High physical branch cost [enabler—exogenous]*: Opening a physical bank branch requires a significant pre-opening investment to pay for building, equipment, and personnel. To the contrary MFS that serves a rural community can be established with a purchase of a four hundred dollar (\$400.00) hand held device, a small vault, and two clerks. This low upfront investment using MFS, branchless banking has a significant cost advantage over traditional brick-and-mortar approaches in reaching the unbanked community, especially in rural areas where communities are sparsely populated.

Enabler—Endogenous: These factors are triggered within the MFS environment, hence endogenous to MFS, and the factors motivate patrons to consider MFS as an alternative solution, hence enablers of MFS.

- *Transformational vs. additive model [enabler—endogenous]*: There are two models in MFS adoption—additive model and transformative model. Additive model is providing additional services to an already existing bank account holder; transformational model on the other hand is the offering of new

services that are targeted to the unbanked [20]. MFS services currently offered by most large banks fall under the additive model including account alerts (security alerts and reminders); account balance (updates and history); customer service via mobile phones; branch or ATM location information; transaction verification; and mortgage alerts [21]. An example of transformational model is offering branchless banking through agent networks that are prevalent in unbanked communities, i.e. cash-in and cash-out features at kiosks and grocery stores. While some traditional banks are beginning to offer transactional services that go beyond static information and alerts; all these features and core banking transactions are “out-of-the-box” features for MFS that are available from day one.

- *“Access to all” design principle [enabler—endogenous]*: Many of the features offered by traditional banks are browser based, requiring internet access, and primarily designed for smart phones. While adoption of smartphones is growing steadily the dominant mobile phone devices are still feature phones, this is true even in high-income countries in US and Europe; the prediction is that both US and European smartphone market will reach 50% in third quarter 2011 [22] [23]. Given these predicaments MFS design should target “access to all” principles addressing both feature phones and smartphones; mobile apps that target only smartphones miss half the market and do so at their own peril.
- *Ubiquitous device [enabler—endogenous]*: The staggering global penetration of mobile devices with 5.3 billion subscriptions is unparalleled for technology adoption. This ubiquitous nature of the mobile device presents MFS as an ideal solution to leapfrog the 2.5 billion unbanked people to the “main stream” financial services.

Bottleneck—Endogenous: These factors are triggered within the MFS environment, hence endogenous to MFS, and the factors hinder patrons from considering MFS as an alternative solution, hence bottlenecks of MFS.

- *Lack of customer oriented services [bottleneck—endogenous]*: financial institutions that take a pro-active role in

creating a positive attitude among their populous have seen a surge in MFS adoption [12]. Governments also need to address consumer protection issues and take measures to promote anti money laundering. This is a bottleneck that should be addressed within the MFS sector.

- *Low transaction volume [bottleneck—endogenous]*: The MFS revenue model is predicated on high transaction volume. The nominal transaction fee, often charging pennies, would only rise to cover overhead and achieve breakeven if the transaction volumes are high. However, many factors including low literacy, lack of awareness, and adoption factors listed in Table 1 as well as TAM constructs result in low MFS transaction rate in many markets hence becoming a bottleneck for MFS adoption.

- *Absence of use policy [bottleneck—endogenous]*: MFS use policy are lagging in many low-income countries. Use policies on lost record, theft, settlement and service disputes, and cash-in mechanisms are needed. For example, in a credit card payment both the merchant and customer have recourse through the credit card provider if settlement or service disputes emerge. A customer with a legitimate service deficiency by a merchant may receive refunds from the credit card agency. Also a convenient mechanism for adding cash to an MFS account (cash-in) is still lacking; the customer has to make a cash transaction at an agent location or create a “debit card” like link to his/her bank account. The later requires clear use policy while the former limits the “anywhere” flexibility of MFS. Hence creating MFS use policies earlier in the process helps reduce its impact as a bottleneck.

Bottleneck—Exogenous: These factors are triggered by the current financial landscape, hence exogenous to MFS, and the factors hinder patrons from considering MFS as an alternative solution, hence bottlenecks of MFS.

- *Supporting services [bottleneck—exogenous]*: For MFS to function basic supporting services like agent networks need to be established. Lack of existing support services networks slows the adoption of MFS, hence an exogenous bottleneck.

- *Absence of regulatory policy [bottleneck—exogenous]*: Governments and the banking sector need to establish regulatory policy to handle innovative services like MFS. For example the absence of clear policies on how electronic cash (e-cash) will be governed creates a bottleneck. The absence of regulatory policy slows the adoption of MFS hence a bottleneck.

- *Lack of telecom infrastructure [bottleneck—exogenous]*: Without a robust telecom infrastructure MFS offerings cannot be relied on. Many low-income countries and even some rural communities in high-income countries are still “work in progress” when it comes to robust telecom infrastructure. Communities that do not have adequate telecom infrastructure would have to overcome this bottleneck before benefiting from MFS.

Discussion

In this section we reflect our analysis of two early adopters of MFS, Kenya and South Africa, and one laggard in the MFS adoption, Ethiopia. Our interviewees indicated MFS in Ethiopia is at “infancy stage”, and recognized Ethiopia is behind the MFS adoption curve. Nevertheless they were enthusiastic about the MFS future and its promises for Ethiopia’s large unbanked community (only 5% of Ethiopian’s have bank accounts) and its large rural community of 72-million (85%). Kenya is mentioned by all interviewees as the prime example of successful MFS adoption with M-Pesa as the prime example. And our interviewees mentioned South Africa for its exemplar MFS innovation.

Our analysis shows that both early adopters and laggards identified with several of the traditional adoption factors including security, trust, resistance to technology, resistance to change, and resistance to innovations. They also identified the benefits of MFS in encouraging savings and investment and its significant potential to generate revenue for the banking industry as well as the cellular network and service wholesalers and retailers. Our discussion of the adoption factors is grouped by the four quadrants shown in Table 1: enabler—exogenous, enabler-endogenous, bottleneck-endogenous, and bottleneck—exogenous.

[Enabler—Exogenous]: To overcome complex procedures and eligibility norms of a traditional bank South Africa instituted a legislation that allowed “lighter” control for opening accounts

with restricted limits on transaction and maximum balances. This helped promote MFS in South Africa. In contrast Ethiopia's short term strategy was to increase building traditional bank branches. South Africa has designed a framework which has helped solve issues associated with high cost of retail banking and difficulties to access for these services. Our interviewees recognized the enabler effect of MFS for exogenous factors and sited MFS as a solution to overcome the limited bank access faced by the country, one bank for every 100,000 people. They also recognized the benefits of MFS in reducing transaction and maintenance costs, improve accessibility, and save cost by targeting branchless banking rather than traditional branches.

[Enabler—Endogenous]: In addressing "Access to all" design principle South Africa favored joint ventures between technology providers and banks to design MFS system that works on smartphones and feature phones as well as across mobile service provider networks as demonstrated by two joint ventures including WIZZIT and MTN Banking [24]. South Africa's approach followed the transformational model targeting unbanked communities. In contrast Ethiopian banks focused their MFS offerings on additive model providing existing account holders mobile account information alerts. Our interviewees confirmed that the only MFS service they can currently access is account status information. They also indicated that MFS policy in Ethiopia is nonexistent and cited that electronic contracts and signatures are not supported by Ethiopian law. In addition, the interviewees recognized the opportunity created by the growing mobile phone penetration and the easy financial access MFS avails in improving financial accessibility in the country.

[Bottleneck—Endogenous]: To overcome lack of customer oriented services the central bank of Kenya adopted a fairly positive attitude regarding the introduction of mobile financial services and its assimilation in the market. In contrast there is no MFS use policy in Ethiopia. Despite the current status quo the interviewees showed promise in the aggressive Government Strategic Plan of 2011-2015 which targets to expand telecommunication infrastructure [25].

[Bottleneck—Exogenous]: To strengthen its supporting services Kenya developed an agent network which helped overcome physical constraints for MFS delivery. And South Africa developed regulatory framework and policies to facilitate easier access to MFS. Furthermore, South Africa's telecom sector provides access to traditional financial services through sound data collection and monitoring. In contrast Ethiopia's

supporting services and its telecommunication infrastructure is weak. While the country is making commendable progress in electric generation the frequency of power interruption diminishes the viability of supporting services. And internet costs are high; while the recent fee reduction for Internet access is welcome news for MFS adoption, Ethio-telecom slashed its Internet access fees by 85% after its recent management transition to a private French company, the costs are still high for the average citizen. Kenya has managed to effectively leverage a cost effective MFS solution to make it more affordable to people in its target market. For example, registration is free and small denomination money transfer using the M-Pesa platform has a cost advantage by a factor of thirty, i.e. sending \$142.00 costs \$0.80 through M-Pesa compared to \$25.00 through Western Union [24]. MFS is recognized for reducing transactional costs [26]. Our interviewees recognize the challenges of deploying MFS due to the lack of legal framework, regulatory framework, government policies, and regulations as well as the need to liberalize the telecom sector they remain hopeful about the government's growth and transformation plan to improve telecommunication infrastructure and to address the inadequate financial services [25].

Additional factors: Our interviewees identified several adoption factors that are not noted in our list of adoption factors in Table 1. We recommend further analysis and discussion prior to including these additional factors to the list of adoption factors. The additional factors include:

- *Lack of awareness.* Our interviewees have suggested a concerted awareness and promotion effort in three stakeholder groups including government officials, policy makers, and the citizenry.
- *Motivation.* A dichotomy of motivation was cited by the interviewees. On the one hand a highly motivated mobile cellular network provider and on the other hand low motivation by banks. It should be recognized the banks in Ethiopia, similar to other low-income countries, do not own their own network services. Any effort to provide MFS requires a three way partnership between the bank, the cellular network provider, and a technology (MFS) provider.
- *Low literacy level.*
- *Language.* Ethiopia is a multi-ethnic nation with at least 70 different languages. Disseminating a national solution given the language diversity is daunting; enforcing a single language is equally daunting.
- *Degree of dependence on the mobile technology.* Our interviewers posited

that the country has no other alternative channels to reach the rural masses, hence must embrace MFS.

- *Personal financial infrastructure.* Many of the unbanked and under-banked individuals pay cash for most of their services. Cash-based transactions encourage a more frugal mindset among consumers, who embrace their "pay before" spending paradigm (via prepaid mobile accounts) as opposed to the ruinous "pay after" model (with credit cards) which fueled the financial bubble that led to the current global recession [27].

Conclusions

This study used literature review to identified MFS adoption factors that are unique to unbanked and under-banked communities and analyzed the impact of these factors by analyzing early adopter and laggard countries. For successful early adopters we used Kenya and South Africa. Ethiopia was used to understand laggard country characteristics in the adoption of MFS. A literature review was conducted to understand the MFS adoption success factors in Kenya and South Africa and a pilot interview with domain experts was conducted to study Ethiopia's MFS adoption patterns.

We identified 13-MFS adoption factors and categorize them in a two-by-two metrics looking at enablers vs. bottlenecks and exogenous vs. endogenous. Further, we used the early adopter and laggard countries to understand how the MFS adoption strategy differed between the two groups.

Based on our analysis we make the following recommendations:

- *Enabler—Exogenous:* MFS adoption factors including complex procedures and eligibility norms, cost of account maintenance, high borrowing rate, and high physical branch cost are triggered by traditional financial services sector and serve as enablers for MFS adoption. MFS adoption, however, must notes the negative impact these enabler-exogenous factors encumber on MFS adoptions and device strategies similar to the early adopters to succeed in the MFS adoption.
- *Enabler—Endogenous:* MFS adoption factors including transformational model approach, "access to all" principle, and ubiquitous devices are enablers inherent to MFS. Hence adopters should take advantage of these enablers and promote

their implementation to achieve MFS adoption success.

- *Bottleneck—Endogenous:* MFS adoption factors including lack of customer oriented services, low transaction volume, and absence of use policy are inherent to MFS sector but they discourage the adoption of MFS. Similar to what the early adopters did to overcome these challenges MFS adopters should follow suite to address these bottlenecks.
- *Bottleneck—Exogenous:* MFS adoption factors including supporting services, absence of regulatory policy, and lack of telecom infrastructure are triggered outside of the MFS sector, hence MFS adopters should heed the lessons learned from the early adopters and laggards to achieve success.

This research is work-in-progress. The recommendations made here are based on a very small pilot study. A full study is forthcoming to conduct further analysis; hence the recommendations may not be generalizable.

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FACTORS AFFECTING ACCEPTANCE OF SMS MARKETING

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ABSTRACT

This study intends to explore the factors affecting Thais' acceptance of mobile marketing. Previous studies have shown significant differences between informativeness, entertainment, and permission. Moreover, transparency of information disclosure and image congruence have not been studied in this context. We found that personalization, informativeness, entertainment, transparency of information disclosure, and subjective norms are factors affecting acceptance. The sample population accepts a marketing message by considering mainly its value/utility and opinion of reference group; they accept mobile marketing based on utilitarian reasons more than hedonic consumption.

Keywords: SMS Marketing, Mobile Marketing Acceptance, Theory of Reasoned Action

INTRODUCTION

Mobile cellular subscriptions in Thailand grow steadily from 3,056,000 in 2000 to 65,952,313 in 2009 [15]. Short message service (SMS) is popular especially during holidays resulting in critical mass of both mobile phone and SMS. The ubiquitous and interactive nature of the device allows two-way communications between users and marketers. [4] Location-based services allow mobile network operators to locate the user/consumer [30] and use location information to align marketing service with needs [30] [37] resulting in the mobile phone becoming a popular marketing device. However, the ubiquitousness property which allows marketers to reach mobile consumers without the restraints of time or place may annoy consumer and become ineffective or rejected.

In Thailand, consumer's annoyance is also a major problem in mobile marketing. A study by [5] shows that only 4.17% of Thai mobile users have positive attitude towards mobile marketing. 83% of complaints registered at the Telecommunications Consumer Protection Institute are due to marketing messages [35].

Researches in marketing and mobile advertisements have shown that mobile users accept messages that satisfy the criteria of entertainment, informativeness, and

personalization, but the results are inconsistent. [34] [37] found that entertainment affects the attitude of Taiwanese and Chinese, respectively, which differ from the results of [8] that studied Bangladeshi. [34] points out that informativeness has a positive effect on Taiwanese attitude while [8] and [37] found that it doesn't affect Bangladeshi and Chinese attitude. Another major inconsistency is that many research found consumers have positive attitude towards permission-based mobile marketing [3] [34] but [36] found that permission is not a significant factor. Inconsistencies between results show that acceptance may depend on individual needs.

Self-concept theory shows that consumers may also decide to consume based on image or symbolic reasons. Products and services have symbolic roles for owners. Consumers are motivated to develop their self-concept by consuming products that possess certain images. [20] Products with images must be seen by others during purchase, consumption, or disposal [24] Mobile phones are generally kept close at hand and considered a status symbol [4]. Marketing communication can be sent to consumers' mobile phones without constraints on time or place, resulting in any-time any-place consumption of messages. We may say that mobile marketing communication is a service with symbol. We are thus studying this topic because acceptance may also come from impression of or desire for images instead of purely utilitarian reasons.

One disadvantage of personalized services is that consumers must disclose some personal information [9] Awareness of the risk involved in mobile marketing make consumers afraid that the information will be used without their permission or knowledge [4] which can be considered an invasion of privacy [9]. Privacy Concern thus becomes a major issue in electronic communications that has been widely studied. Privacy concern has a negative relation with purchase [28] and significantly affects trust in websites [6]. Personalization and concern for privacy influence usage of personalized on-line services [7] Information privacy concern has a negative effect on information disclosure intention and a positive effect on protection intention [38]. We may conclude that uncertainties on how consumer information will be used, including for whom and for what purpose, has a negative effect on consumer attitude. Although personalization is useful for

consumers because they will receive marketing messages that are fewer and more specific to their interests, privacy concern should not be ignored because consumers will not feel certain that they should accept SMS mobile marketing as a good thing. Hofstede's uncertainty avoidance dimension describes how societies (people) in culture with high uncertainty avoidance use custom and formal rules to guide behavior and response to uncertain or ambiguous situation [14, p.110]. Although acceptance is a personal decision and even Hofstede (1994) warn of the danger in using a country's score to predict individual's behavior [33], Hofstede's cultural dimensions can guide us in the search for relevant factors. Thai culture's relatively high uncertainty avoidance score may make Thais prefer clarity in uncertain situations. Therefore, if marketers openly disclose how they collect and use personal information, Thai consumers can feel more confident so that they will eventually accept marketing communication.

Finally, Thai culture scores high on collectivism [13, p.53] Persons in such culture are more likely to involve others in their decisions by asking for opinions from friends and families [21, p.155]. Their decision and behavior are influenced by reference groups. This study will explore whether subjective norms will affect acceptance of persons in a collective culture.

The objects of this study are 1) factors affecting acceptance of SMS marketing, 2) how the informativeness and entertainment factors differ from other countries, and 3) the form of SMS marketing that will be acceptable to Thais. The result of the study can help marketers communicate with millions of mobile phone customers. It can also help guide the planning of marketing communication strategy through mobile phones / create campaigns that are appropriate to consumers needs. The result of this study may also show that acceptance of mobile marketing depends on utility, subjective norms, and images – in contrast with other studies which consider only utility and subjective norms.

LITERATURE REVIEW

Acceptance

There are many theories that model how users come to accept and use a technology: Technology Acceptance Model, Diffusion of Innovation, and Theory of Reasoned Action. We did not use Technology Acceptance Model because [22] shows that, in a high power distance culture, *perceived usefulness* and *perceived ease of use* do not significantly affect behavioral intention. Diffusion of Innovation theory may not be

appropriate because SMS marketing is widespread and definitely not new. This study follows the framework of Theory of Reasoned Action.

Informativeness & Entertainment

Use and Gratification Theory of [17] shows that message recipient want more information, knowledge, understanding, and aesthetically pleasing experience. [34] [4] [36] show that if mobile marketing messages are designed to have informational value or provide useful information (informativeness), consumers will have positive attitude. [34] [4] [37] [36] show that entertainment is an influential factor on consumer attitude.

Personalization

Personalization builds customer loyalty by creating a meaningful one-to-one relationship through understanding of individual's needs and responding to them by using contextual knowledge [31]. [37] shows that personalization is an influential factor on Chinese mobile phone users' attitude.

Transparency of Information Disclosure

Hofstede's uncertainty avoidance dimension describes how societies (people) in culture with high uncertainty avoidance use rituals and formal rules to guide behavior and response to uncertain or ambiguous situation [14 p.110]. Applied to privacy issue, this dimension helps us understand that Thai consumers with high uncertainty avoidance may prefer clarity in uncertain situations. Transparency of information disclosure helps reduce such uncertainty by informing the users about the purpose of collecting and retaining personal information.

Permission

Permission-based marketing requires consent to receive messages from the consumers while allowing them to cancel at any time [2]. [3] shows that more than half of mobile users are satisfied with advertisements that require permission. [34] shows that permission-based features result in positive attitude.

Image Congruence

Self-concept represents the totality of the individual's thoughts and feelings having reference to himself as an object [24]. Each person has an (possibly many) image of himself which describes his personality, character, ownership, relationship, and behavior [32]. This concept can be categorized further into 1) Actual Self-Concept or how he sees himself, 2) Ideal Self-Concept or how he would like to see himself, 3) Social-Self Image or how he feels others see

him, and 4) Ideal social self-Image or how he would like others to see him [32]. This study will skip Social-Self Image and Ideal social self-Image because they are closely related to Subjective Norms.

Products and brands have certain images and symbolic roles for ownership and for show. Consumers are thus motivated to develop their self-concept by consuming symbol products [20, p.314]. These symbolic values are assessed based on congruence with personal image [32]. Congruence theory posit that higher congruence make people like the brand more [20, p.314]. [18] shows that congruence between self-image and service image strongly affect the attitude on mobile financial services.

Attitude, Subjective Norms, and Intention

Theory of Reasoned Action by [1] points out that intention results from attitude and subjective norms. Behavioral intention can be predicted from attitude towards such behavior, which is consistent with studies by [34] [4] [16]. Moreover, if consumers believe or are aware that people they trust want to accept SMS marketing, they will be intent to accept SMS marketing themselves. [25] further points out that subjective norms is the strongest predictor of Taiwanese consumer intention to accept advertisement via SMS. [4] shows that subjective norms has an admittedly weak influence on intention to accept mobile marketing. TRA also shows that normative belief about others' expectations cause subjective norms, and must be considered together with motivation to comply because society has a weaker influence on individualists than on conformists.

RESEARCH FRAMEWORK

The framework for this research is based on Theory of Reasoned Action which stated that human behaviors can be controlled through reasoning by the *intention for the behavior*, which, in turn, results from *attitude* towards that behavior and *subjective norms* effect which are influenced by beliefs. Research has shown that if consumers believe the marketing message is *informative*, respond to *entertainment* need, *personalized* according to individual need, the attitude will be positive. If consumers believe there is a *transparency of information disclosure* on how their personal information are collected and used, consumers will be confident enough about SMS marketing to have a positive attitude. Moreover, any messages sent to consumers should have their *permission* first. SMS marketing may also have symbolic value to consumers, with image congruence between

actual and ideal self-images that will result in positive attitude. Finally, if consumers believe that people who are important to them think they should receive SMS marketing (*social beliefs*) and if they have the *motivation to comply*, consumers will feel the pressure from *subjective norms* that will result in intention to receive SMS marketing.

There are 10 research hypotheses from this framework:

- H1) Perceived Informativeness has a positive effect on attitude towards acceptance of SMS marketing.
- H2) Perceived Entertainment has a positive effect on attitude towards acceptance of SMS marketing.
- H3) Perceived Personalization has a positive effect on attitude towards acceptance of SMS marketing.
- H4) Transparency of Information Disclosure has a positive effect on attitude towards acceptance of SMS marketing.
- H5) Consumers' belief that mobile marketing requires *permission* has a positive effect on attitude towards acceptance of SMS marketing.
- H6) Congruence between *actual self-image* and SMS marketing image has a positive effect on attitude towards acceptance of SMS marketing.
- H7) Congruence between *ideal self-image* and SMS marketing image has a positive effect on attitude towards acceptance of SMS marketing.
- H8) Positive attitude towards acceptance of SMS marketing results in consumer intention to accept SMS marketing.
- H9) Influence of social group and belief about other people's expectation, together with motivation to comply with others result in subjective norms.
- H10) Subjective norms has an influence on intention to accept SMS marketing.

METHODOLOGY

Sampling

Research targets are Thai mobile phone users in Bangkok between 18–63 years old who have used SMS before. Bangkok has the largest number of mobile phones in Thailand and use more communication features such as SMS than other urban areas. Simple random sampling is used to obtain subjects.

Out of 668 questionnaires received, 626 are completed correctly, with 46.5% male and 53.5%

female. 36.9% of respondents are between 18–24 years old. 36.7% received SMS marketing messages weekly, 23.5% daily. Most of them (48.7%) received 1–5 messages each day in the past three months.

As for the format of marketing messages through mobile phone, most respondents receive product information (52.4%) followed by invitations to attend product fairs (38.3%), a chance to win prize advertised on product labels (38.3%), discount code (33.1%), newsletter with product information (19.3%), registration for gasoline discount (12.5%).

Measurement and Scaling

This study use questionnaires to test the hypotheses, using validated measures from past studies (except for transparency of information disclosure).

Entertainment: adapted from [10] [34] [4]

ENT1: I feel that receiving SMS marketing is enjoyable.

ENT2: I feel that receiving SMS marketing is pleasant.

ENT3: I feel that receiving SMS marketing is entertaining.

ENT4: I feel that receiving SMS marketing is exciting.

ENT5: Participating in an SMS marketing is fun.

Informativeness: adapted from [10] [34] [4] [37]

INF1: I feel that SMS marketing is a good source for timely information.

INF2: SMS marketing provides the information I need.

INF3: SMS marketing is a good source of up-to-date product information.

INF4: SMS marketing supplies complete product information.

INF5: SMS marketing is a convenient source of product information.

Permission: adapted from [23]

PEM1: It is important for me that I can control the permission to receive SMS marketing.

PEM2: It is important for me that I can refuse to receive SMS marketing.

PEM3: It is important for me that I can filter SMS marketing to match my need.

PEM4: I would only be prepared to receive SMS marketing if I had provided my permission.

Personalization: adapted from [7] [37]

PES1: I feel that SMS marketing displays personalized message to me.

PES2: I feel that mobile advertising is personalized for my usage.

PES3: I value SMS marketing that are personalized on information that I have voluntarily given out but can identify me as an individual.

PES4: I value SMS marketing that are personalized on information that I have voluntarily given out but cannot identify me as an individual.

PES5: I value SMS marketing that are personalized on information that is collected automatically.

Transparency of Information Disclosure: created specifically for this study

TOID1: SMS marketing should disclose the purpose of using your personal information.

TOID2: SMS marketing should disclose the purpose of using your personal information when the purpose has changed.

TOID3: SMS marketing should completely disclose the details of how they use your personal information.

TOID4: SMS marketing should disclose the duration that your personal information will be retained.

TOID5: SMS marketing should disclose the details of personal information that will be kept in databases.

TOID6: Knowing which databases contain your personal information is better than not knowing where your personal information is kept.

Attitude: adapted from [34] [4] [37]

ATT1: Overall, I like SMS marketing.

ATT2: Generally, I find SMS marketing a good thing.

ATT3: I like the idea of using SMS marketing.

ATT4: I like SMS marketing.

ATT5: Using SMS marketing is a wise idea.

Subjective Norms: adapted from [1] [4]

SN1: If you accept SMS marketing, people important to you will see that it is useful.

SN2: You will accept SMS marketing if you feel that people important to you think you should do so.

SN3: If you accept SMS marketing, people important to you will see that it is valuable.

SN4: If you accept SMS marketing, people important to you will think you are smart.

Normative Beliefs and Motivation to Comply: adapted from [1]

NB1: You will accept SMS marketing according to the needs of family members.

NB2: You will accept SMS marketing according to the needs of close friends.

NB3: You will accept SMS marketing according to the needs of colleagues/classmates.

MC1: You usually act according to what your

family members think you should do.

MC2: You usually act according to what your close friends think you should do.

MC3: You usually act according to what your colleagues/classmates think you should do.

Intention to Adopt SMS Marketing: adapted from [16] [25] [1]

INT1: If I see advertising asking me send text message to get free coupon on my cell phone I will send the text message to the number.

INT2: If I receive a useful ad message on my cell phone, I will send back text message to the number to ask more information.

INT3: I intend to accept SMS marketing messages in the future.

INT4: If I receive a useful ad message on my cell phone, I will call back to the number to get more information.

INT5: If I receive a coupon message on my cell phone, I will visit the specific shop to use the coupon.

This study uses a six-point Likert scale ranging from strongly agree to strongly disagree.

To measure the image dimension, we use measures from [11] [18]. Because some properties are not relevant to mobile marketing, we use individual interviews with 20 subjects who have received SMS marketing before. Subjects assess all 15 properties to pick those that can describe the images of SMS marketing and mobile phone users. We then select only properties that are selected by more than 70% of the subjects, which are properties that reflect 1) modern/old-fashioned 2) fast/slow 3) technology leader/follower 4) professional/amateur and 5) effective/ineffective. Congruence score is calculated from

$$D = \sqrt{\sum_{i=1}^n (P_i - S_i)^2}$$

Where D = difference score reflecting congruence between images of consumer and of SMS marketing.

i = image dimension

S_i = perceived image of SMS marketing in the i dimension

P_i = perceived self image in the i dimension

RELIABILITY AND VALIDITY

Reliability of Measures

We pre-test the questionnaire with 159 mobile phone users in Bangkok to measure internal consistency reliability using Cronbach's alpha analysis which should be higher than 0.7 [12].

Cronbach's alpha of entertainment = .9074, informativeness = .7493, personalization = .7785, permission = .9286, transparency of information disclosure = .9061, attitude towards SMS marketing = .9278, subjective norms = .8576, normative beliefs = .9035, motivation to comply = .8589, intention to adopt SMS marketing = .8773, actual self image = .8397, ideal self image = .8972, and SMS marketing image = .8458.

Validity of Measures

We perform factor analysis to evaluate construct validity using Principal Component Analysis (PCA) with varimax rotation. Factor loading value of 0.45 is used as the criteria [12]. Results show that all variables in this study have factor loading higher than 0.45 except INF4 and INF5. We also eliminate ENT1 because it meaning is very close to ENT3 but with lower factor loading. The factor loadings are as followed:

ENT1 - ENT5	= .756 .832 .834 .699 .588
INF1 - INF5	= .697 .5840 .579 NA. NA.
PEM1 - PEM4	= .832 .837 .768 .769
PES1 - PES5	= .562 .565 .596 .602 .583
TOID1 - TOID6	= .706 .770 .851 .817 .733 .811
ATT1 - ATT5	= .756 .690 .687 .685 .528
NB1 - NB3	= .559 .724 .754
MC1 - MC3	= .604 .765 .742
SN1 - SN4	= .815 .635 .713 .553
INT1 - INT5	= .700 .801 .632 .666 .669
AMG8 AMG11 AMG13 AMG14 AMG15	= .763 .775 .625 .776 .797
IMG8 IMG11 IMG13 IMG14 IMG15	= .569 .632 .782 .862 .837
SMG8 SMG11 SMG13 SMG14 SMG15	= .623 .721 .844 .822 .733

RESULTS

Model Testing

This study uses multiple regression analysis to test hypotheses. We found that attitude towards acceptance of SMS marketing are influenced by personalization, informativeness, entertainment, and transparency of information disclosure. These 4 variables can account for the attitude towards acceptance with R² = 0.393 and Betas = .263, .201, .195, and .182 respectively. On the other hand, permission, actual self image congruence, and ideal self image congruence do not significantly affect the dependent variable (p = .724, .260, .145 while Beta = -.011, .036, -.046). Therefore, H1-H4 are supported while H5-H7 are not supported.

Social belief has an effect on subjective norms (p = .000, Beta = .167). Finally, attitude towards SMS marketing and subjective norms can help explain intention to adopt SMS marketing (R² = .362) and Betas = .570 and .18. Thus H8-H10 are supported.

SMS Marketing Acceptable to Thais

We found that SMS marketing messages acceptable to Thais can be classified into 4 standard types following the framework by [29] 1) information such as travel advices, registration to receive useful information 2) entertainment such as sending an SMS to register to receive wallpapers and view movie trailers 3) raffle like winning a shopping trip with friends and family 4) coupons.

DISCUSSION

The results from our questionnaire show that marketers should be creative with marketing messages by personalizing the message to fit the interest of each mobile phone user. The message must also be useful, informative, or entertaining – with emphasis on informativeness because the result shows that informativeness is more important than entertainment. Moreover, marketers should disclose in details how they will use consumer personal information so that consumers will feel confident that their information is protected. They can then feel assured and can accept SMS marketing.

Finally, attitude towards acceptance of SMS marketing is more important than subjective norms. Marketers should design marketing communications and promotional campaigns that emphasize the importance of directly approaching consumers rather than through influential friends or mobile word-of-mouth.

This study provides evidence that Thai mobile users accept mobile marketing based on utility and subjective norms, while the form of SMS marketing that they can accept are the standard types classified in [29].

THEORETICAL IMPLICATIONS

Although the sample group place more importance on utility factor than entertainment factor, opposite to the findings of [34] [4] [36]. The reason may be that the form of SMS marketing that users are most familiar with is informative rather than entertaining, as can be seen from our result which shows that 52.4% have received informative messages while entertaining SMS like trying to win prizes has only 38.3% participation rate. Nonetheless, both factors affect the attitude of mobile users in accordant with Use and Gratification theory [17] which states that message recipient will be satisfied if the message 1) increase information, knowledge, understanding and 2) improve aesthetic experience, pleasant, and stimulating.

Collectivism makes subjective norms affect acceptance. However, accepting SMS marketing is highly individualistic. Thais place more importance on attitude than subjective norms. The result suggests that people can be both individualistic and collectivistic. The focus changes depending on the current situation, in agreement with Theory of Reasoned Action which states that the importance of attitude and subjective norms depend on situations and individuals.

Permission is useful in reducing spam, but research has shown that permission is not significant for our study, similar to the results found by [36] but in contrast with [3] [34]. The reason might be that when users do not recognize that the number being used to send marketing message belong to with which they are familiar, they can simply erase the message without opening it. The time and cost involved is lower than calling the sender.

Mobile phone users place importance on personalization of marketing message the most because users can then receive only the messages they are interested in. Similar to permission, it also reduces annoyance from receiving too many messages, but it is more convenient because they don't have to grant and revoke permission on each product/service of each company. All other things being equal, this relative advantage will make people choose personalization over permission.

Finally, this study shows that the sample group consumes mobile marketing messages based on utilitarian reasons rather than hedonic consumption or the happiness that will arise from messages with images that align with their self images. For Thai consumers, entertainment has less influence on attitude than informativeness. Image congruence (both actual and ideal) do not affect attitude.

LIMITATIONS AND FUTURE RESEARCH

This research is limited by its sample group. Although the questionnaires are randomly distributed, most replies come from young people between 18–24 years old (36.9%). This digital generation is familiar with technology and surrounded by information. They are highly individualistic and their decision to consume is probably based on themselves rather than other people's opinions. It is thus difficult to say that the result of this study will remain the same is the sample group are more widely diverse. Moreover, there may be some limitation on the language

used to construct measures because the original questions are in English, so they had to be translated into Thai.

Based on this limitation, future research may be done on a more diverse sample population with different lifestyles and consumption behaviors. On the other hand, comparative studies can also be done on a number of subgroups with specific population segments so that we can find out the most appropriate way to design SMS marketing for each subgroup, or find other utilitarian reasons that may affect the decision to consume messages, such as economic utility.

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IT GOVERNANCE FOR SYSTEMS SUPPORT AND MAINTENANCE: VIEWS FROM CIOs IN MULTINATIONAL ENTERPRISES

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ABSTRACT

This paper explores IS governance as it relates to systems support and maintenance (SS&M). We argue, that can be critically supportive of business operations, decision making, innovation and knowledge management strategies. Based on interviews with high level IS practitioners from large IT companies, we find that the value of SS&M as a potential link between the IT side and the business side of the organization, while recognized is still under-utilized. We enumerate and discuss a number of reasons for this situation from an IT governance perspective and call for a comprehensive research agenda to develop an integrated approach to link SS&M more closely.

Keywords: *IT Governance, Systems Support and Maintenance, Enterprise Systems*

Introduction

Existing Information Systems (IS) research has usually focused on adoption processes such as the incentives for adoption, selection of solutions, and analysis and design. A direction in Information Systems that needs further attention is the continuing governance of Systems Support and Maintenance (SS&M) and its relationship to company operations. Whereas industry practitioners and academic researchers fully realize the importance of investment and adoption in the latest technologies for quality and productivity improvements, SS&M issues associated with these enterprise systems tend to receive insufficient management attention (Olson 2004; Stephens 2004). In the United States upward of 20% of gross fixed capital formation is invested in ICT (hardware, software and communication networks) (OECD 2007). Given that these assets require SS&M, a significant portion of the total cost, this lack of interest in the issue is surprising (Mookerjee 2005) and most studies of IT governance focus on acquisition rather than post adoption activities.

‘Governance’ refers to the distribution of decision making rights and obligations and the procedures and mechanisms for making strategic decisions and monitoring their outcome in an organizational context (Peterson 2004). IT Governance configurations are designed to allocate accountability, facilitate interaction and create alignment to the corporate resources related to IT. In systems support and maintenance,

IT governance provides the necessary oversight and cohesion that can encourage and facilitate the opportunities for accumulating organizational knowledge and fostering innovation.

SS&M refers to all activities related to an IS system after implementation. From a limited perspective this might only involve the reconfiguration of software that is not working properly, maintaining and updating hardware, or service to the end users. Such a perspective is indeed a common perception. In fact, however, SS&M also includes activities that support business operations and decision making thus critically supporting corporate strategy. Studies point out that over 80% of SS&M efforts are associated with non-corrective actions (Pigosky 1996) including responding to user, business and environmental demands for new and necessary features — a potentially endless job.

IS is now firmly integrated into the organizational environment and involves people, hardware, software, data, and business processes and by extension related management challenges and the managerial behavior at individual, group, and organizational levels (e.g., O’Brien 2001; Galliers et al. 2006). Silver et al. (1995) go further, arguing that information systems is now a fundamental part of organizational structure, culture, and corporate strategy.

SS&M also encompasses other critical areas for the business, such as IS disaster recovery, information security and auditing, and post-adoption IT staff retention (e.g., Parikh 1986; Pigoski 1996; Hsu 2003; Drew 2005). While some organizations pay attention to these critical areas, others take a very ad hoc approach.

It is clear that high quality SS&M not only directly affects a company’s return on its investment, but potentially has a critical influence on a business’s ability to survive and prosper. SS&M becomes even more critical during times of economic downturn when money is in short supply for new system implementations and businesses have to make the best of what they have. SS&M is a critical factor in maintaining complex business operations on a limited budget (Banker et al. 1993). Even off-shoring various business functions, such as manufacturing, has an impact on SS&M activities by possibly involving IT Governance including the relocation of existing IT staff, the outsourcing of SS&M activities, and/or the recruitment and training of new SS&M teams (Wang and Ho 2006). And yet, the allocation of organizational resources to

developing new systems and maintaining the post-adopted systems have rarely been jointly studied (Swanson and Beath 1990).

This paper reports our study exploring on what we see as the IT Governance issues concerning SS&M, particularly in the multinational enterprise context. We hope the research data inspires future research. The next section presents some background into research in IT Governance and in SS&M and essentially argues the case that their interrelationship needs more attention and study. The methodology section discusses the interview format and the participants interviewed in this study. This is followed by the findings, discussion and lastly the conclusions and implications where we call for a more integrated approach linking SS&M more closely to academic research and organizational management at a governance level.

IT Governance and Systems Support and Maintenance Mindset of SS&M

SS&M at the post-adoption stage is not attractive — IT people prefer to be involved with the development of new systems rather than the maintenance of older systems. The outcome of former efforts may be easier to get recognized while the latter tends to be considered to be essential work. Back in 1981, Glass and Noiseux (cited in Edwards 1984, p. 254) came up with six major reasons why IT people are not attracted to SS&M at the post-adoption stage and they bear repeating here as they still seem to be relevant:

SS&M is intellectually very difficult;

SS&M is technically very difficult;

SS&M is unfair: necessary information is not available and the original developers are usually long gone;

SS&M is no-win: people only want problems solved after major contributions have been recognized in the system adoption process;

SS&M work does not result in glory, noticeable progress or chances for 'success'; and

SS&M lives in the past: the quality of yesterday's development work is often poor.

A number of critical reasons for the lack of attention to IT governance in SS&M in the organization may come under the rubric "design trade-offs" (El Sawry and Nanus 2001). In looking at robustness analysis of systems design, El Sawry and Nanus list nine considerations that focus specifically on design choices that compare immediate and long-term considerations. Most of these considerations involve SS&M issues: two are illustrative. One trade-off is short-term versus long-term. The authors argue "there needs to be more focus on a better balance between front-end design costs and the continuing adaptation and SS&M of the information system". They continue: "the best measure of implementation success must include the long-term cost/benefit calculation of all costs and benefits over the expected life of the system" (p. 39). SS&M has been identified as the most expensive aspect of the IS lifecycle (Parikh and Zvegintzov 1983 in Dekleva 1992). However, the IT governance structure and original cost-benefit analysis of a new project generally does not

include the significant cost of post adoption SS&M which is often under-reported so as not to lessen the chances of the project's acceptance. In particular, given that most systems adopted in modern organizations are getting more complex and more numerous, SS&M costs have likewise been increasing (Banker et al. 1993). Mookerjee (2005) states that SS&M costs for a system increase with the number of associated systems since the turning to any of the interacting parts may result in changes to the system. In reality, once the development proposal is accepted it is difficult to find the money to hire the staff needed to support the system (Edwards 1984).

Another trade-off is incorporating future discontinuities versus present extrapolations. In a nutshell this involves taking an anticipatory stance towards design requirements. Rather than considering future possibilities in terms of present concepts, systems design must consider the current environment in terms of future possibilities. This trade-off is of particular interest since it implies sophisticated knowledge and skills in anticipating and forecasting change in business, user and environmental requirements — knowledge and skills that come through experience and SS&M staff training. Furthermore, a lack of interest in SS&M issues may be because there is often confusion between what is part of the development process and what is considered to be SS&M. For example, a common belief is that SS&M is not separate from the system development cycle; however, research shows that a number of unique activities and practices such as incorporating vendor patches, fixing user problems, solving conflicts with software updates, and monitoring response times, thresholds, and error logs only exist in the software maintenance process (Dekleva 1992; Pigoski 1996; Bennett 2000; Olson 2004). Yet these activities do not cover the costs associated with change of business processes which is a part of IS.

IT Governance

Studies in IT governance began in the early 1990s (Loh and Venkatraman 1992) and have focused on governance structures such as the distribution of IT authority (e.g., Sambamurthy and Zmud 1999) or the work of steering committees (e.g., Karimi et al. 2000), but also on governance processes such as IT strategy development (e.g. Van Grembergen et al. 2004) or decision making practices (e.g., Sabherwal and King 1995).

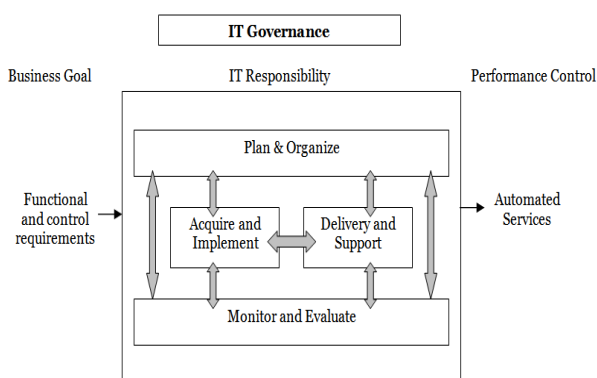
Wilkin and Chenhall (2010) state that the increasingly strategic and functional role of IT and related issues of decision rights and tactics has led to a shift from what has been known as IT governance to what is now understood as enterprise governance of IT. This understanding sees IT governance as "an integral part of corporate governance" (Van Grembergen and De Haes 2009, p. 3). As with corporate governance, IT governance defines and implements "processes, structures, and relational mechanisms in the organization" (ibid.) in ways that align IT to support business and the creation of business value from IT enabled business investments (Van Grembergen and De Haes 2009). The effective application of IT can significantly enhance the likelihood that an organization's strategic goals will be achieved. For example, Weill and Ross (2004) claim an increase in profits of 20% for those firms with effective IT

governance.

The literature does not seem to identify a single best practice for IT governance. However, one thing is clear – successful modern enterprises have well crafted IT governance structures and support from IT staff and the enterprise systems. In these enterprises, executives can effectively respond to the business environment with the use of decision support systems and business intelligence and the general staff are able to do their jobs effectively according to planned processes. The top performing enterprises do not achieve good IT governance accidentally and many organizations still suffer from inadequate support with problematic legacy systems, long queues for IT desktop support, frequent IT system downtime, unfriendly user environments, etc. More seriously, users may lose hope as there is sometimes no likelihood of improvement. Signs of unhealthy IT governance include, but are not limited to, lack of incentive to improve current systems, poor IT staff retention, inadequate resources, and the ignorance of these problems among top management.

SS&M is surely within the scope of the understanding of IT governance given above (Tiwana. 2009, Van Grembergen and De Haes 2009). The most well known framework containing this component is Control Objectives for Information and related Technology (COBIT 2007) 4.1 (developed by the Institute of IT Governance, synthesized in Figure 1) which has four major areas of IT governance – plan and organize, acquire and maintain, deliver and support, and monitor and evaluate – and they are supported by goals and metrics (performance evaluation). This framework provides some guidelines in the sections of AI2 (Acquire and Maintain Application Software), AI3 (Acquire and Maintain Technology Infrastructure), DS13 (Delivery and Support Management Operations) and the associated control objectives.

Figure 1. Synthesis of COBIT Framework 4.1 (2007)



Nevertheless, the great majority of the publications and applications related to this framework have been practitioner-oriented, with very few research articles identified (Ridley et al. 2004) until recently. Moreover, COBIT suggests standard guidelines rather than adding much content to suit various business situations. Current IT governance frameworks have put business change in the planning and implementation phases and addressed SS&M as a support function. Given the dynamic business environment,

in fact, a SS&M team not only conducts routine work but also faces the nature of business changes that could have an impact on SS&M activities. A MIS Quarterly research note (Mithas et al. 2011) indicates that firm performance is associated strongly with information management capability via three intermediate constructs including customer management, process management, and performance management. SS&M would potentially ensure the alignment of the information management capability to the other constructs and thus the performance outcome. By surveying the literature, in short, there is still a lack of research into how IT governance can facilitate SS&M, particularly in a context of multinational and interorganizational contexts (for IOS governance, the related work can be seen in Croteau and Bergeron 2009).

SS&M was reported as under-researched 25 years ago (Edwards 1984). Since then it has not been developed as a major theoretical focus in the research agenda of IS but related issues have touched various sub-fields such as IT governance, IS outsourcing, security and auditing, etc. We believe the need for an integrated view of IT governance toward SS&M remains unmet. According to Edwards, the development lifecycle of an IS system consists of four stages that should be familiar to most people working in IS. These are systems overview, systems design, systems creation and systems implementations. The last step after the fourth stage is the post-implementation audit, which normally occurs within months of implementation and which generally consists of a checklist making sure that the system has met specifications and is functioning. What is absent from the system lifecycle is what happens after the system is implemented, i.e. the managerial issues for SS&M, for continued functioning and adaptation of the systems. While Dekleva (1992) found that modern system development methodology can reduce time spent on emergency error correction, lower the number of system failures, and facilitate changes in functionality as systems age, it does not seem to decrease the overall time needed for SS&M. Based on Edwards' influential paper, subsequent publications and textbooks on the Systems Development Life Cycle (SDLC) have further emphasized the SS&M stage and some have separated it from systems implementation. While some still use the four stages of SDLC, namely feasibility study, systems analysis, systems design, and implementation (e.g., Dennis and Wixom 2003), others incorporate systems support and maintenance into the traditional SDLC or make it an independent stage (e.g., O'Brien 2001; Hoffer et al. 2005; Satzinger et al. 2007). In COBIT, this is mentioned in the three sections as mentioned above.

A team responsible for systems support and maintenance would normally consist of the team leader, systems administrator and one or more systems analysts and programmers depending on the size and scope of the system. For large enterprises, the CIO or a general operation manager might oversee the control and management of all the activities. Apart from the top management, all staff involved in SS&M would need to have strong technical and analytical abilities and experience in troubleshooting and configuring operating systems, both software and hardware. Understanding management functions and business operations is also very important. IT governance here describes how those IT staff

under the governance of an enterprise will utilize the assigned resources to deliver services to users and to achieve business goals (Meyer 2004). While current research tends to focus on the technical side of software maintenance (e.g., developing tools and models) or tracing the design history of software packages (similar to the idea of preventative maintenance or design maintenance approaches) (Baxter 1992), some researchers claim the focus of software maintenance should also be on managerial issues as the total cost of systems ownership is increasing dominated by those issues including IT governance on “systems upgrades, change management, security management, and dealing with the failures” (Bennett 2000; Agerwala and Gupta 2006, p. 176).

In summary, we have found that the links between IT governance and SS&M needs further investigation, particularly in a context of multinational enterprises (in which case, they become interorganizational situations as all subordinates are legally independent firms). If this is the case, then we should expect that the CIOs and senior level IT staff that we interviewed in this exploratory study will concur.

Methodology

The objective of this ongoing exploratory research was to get a snapshot of the state of IT governance in SS&M in company operations and to find out the key issues that senior IT staff are dealing with as they try to keep information systems up and running and supporting current users and business needs. While these interviews are at the early stage of this research, the outcome is expected to help to refine the current research frameworks in IT governance by incorporating SS&M. Thus, we could have a better foundation to continue along this line and perhaps run surveys for confirmatory study in the long term. In this paper, top IT managers from eight multinational enterprises (see Table 1) participated in the exploratory study. As these companies are multinational enterprises, the data were recorded as rough figures based on the interviewees' answers. Exact figures of the company profiles are changing constantly due to the large scale of corporate boundaries and business.

Apart from one system vendor who was suggested by participants, other enterprises were selected from the information technology industry (See Table 1). They are the major hardware companies in different sectors of the global supply chain, ranging from wafer design/production (the raw form of all semi-conductor chips, such as CPU and DRAM), peripheral device production (such as LCD and mainboard), computer systems integration, to a supply focal firm (brand owner/designer). The number of IT staff in these manufacturing companies which have large operation scales to host both systems development teams and systems maintenance teams range from 70 to 700. The participants from the headquarters of these enterprises included a corporate ERP director, an E-commerce director, two MIS senior managers (one in the Computer Integrated Manufacturing section), two chief information officers, a principal IS engineer, and a chief IS project manager (SS&M teams are under their supervision). Each of the interviews took about 1-2 hours and the associated record was reviewed again by the participant so as to ensure the validity.

Table 1. Participants' Demographic Information

Company Code	Industry	No. of Staff
1) I	LCD manufacturer	15,000 (IT: 30 in the interviewee's team, total more than 100)
2) W	IT OEM manufacturer	18,000 (IT: approx. 120)
3) F	Connector & LCD manufacturer	800,000 (IT: 25 in the interviewee's team, total more than 1000)
4) A	IT Channel, Brand, and Manufacturer	2,500 (IT: approx. 70)
5) WB	IC and IO design	6,000 (IT: approx. 140)
6) AC	IT channel, brand	30,000 (more than 100 among the major sites)
7) DM	IS vendor	No record (IT Consultants: 20)
8) T	Semiconductor foundry	28,000 (IT 700)

This stratified sampling method ensures a diverse and perceptive view of IT governance toward SS&M (Neuman 2000). As high level IT managers of global IT companies, they, better than anyone, know the governance concerns surrounding the corporate policies, resources and budget, limitations of software and hardware (e.g., specification of the mean time between failure for IT devices via the design phase), the impact of systems down time (e.g., information provided by one of the participants estimated a loss of at least USD 120,000 per hour if the computer systems associated with one production line go down), and other organization and management issues related to supporting the systems and operations. Moreover, the IT industry itself is in a constant state of flux and the need to coordinate the organizations' IS systems with the changing business environment challenges these senior managers to constantly serve and maintain the systems used by multinational stakeholders.

The participants were asked a number of semi-structured questions on IT governance toward the SS&M operations (Gugiu and Rodríguez-Campos 2007). As we were also interested in finding out how companies can provide more effective SS&M in their operations based on existing IT governance, we asked our participants about the roles of IT governance and how it affects the different facets of SS&M such as policies and organization, resources and budget, technology capability, and business process for value delivery. We are interested to identify the main attributes of a good IT governance structure and how it could facilitate SS&M operations and subsequently provide additional value.

Findings and Discussion

In our interviews with senior IT staff we asked a series of questions about governance structure to facilitate the standard SS&M activities, the role of SS&M in the organization and how it is changing, and how SS&M is perceived in the organization including issues of policy, resources and budget.

We also asked questions about recruitment, IT staff training, and performance evaluation that are related to the literature, e.g., Mookerjee (2005), Wilkin and Chenhall (2010), Mithas et al. (2011), and the COBIT framework. As we have pointed out, there is very little research that links IT governance and SS&M. Perhaps most notable in our findings are the changing perceptions about executives and how they consider the IT governance structure could affect SS&M and its potential to create additional value in the modern organization. We have summarized our discussions of their views on SS&M as being responsible for IT governance in their organizations. We particularly highlight the changes in perception. Table 2 describes how the top IT managers today perceive the interests of SS&M compared to the past views on SS&M activities of IT staff.

However, on the one hand, what we are hearing is that SS&M staff, through their ongoing work with the organization's information systems and the people who use these systems (essentially everybody), have developed a fine and considered understanding of many facets of the business. With their 'radar system' and their sense of the 'pulse' of the business they seem to be a kind of organizational nerve centre. More than one participant suggested that important aspects of organizational knowledge management might well reside in SS&M. Ironically, the one thing that does not seem to have changed in the last 25 years is that system developers are still not consulting with SS&M staff. Most of these multinational enterprises separate the development team from the SS&M team as two different IT groups. The current IT governance structures residing in these companies do not seem to have

Table 2 Past and Present Views on SS&M (issues adapted from Glass and Noiseux, 1981)

Reasons	Today's View	Supporting Quotes
SS&M is intellectually very difficult.	A high level of rigor is required and the challenges of SS&M can be stimulating.	"SS&M is interesting and challenging since our IT staff can learn from all business flows in a global organization. It is the quickest way for an IT professional to increase his/her personal knowledge assets. As a CIO, I would support the idea of valuing the work and putting resources to keep the knowledge assets."
SS&M is technically very difficult.	SS&M is not only a technical issue but also a managerial challenge.	"There is a lot of work to do after new systems are adopted. The connection between new systems and legacy systems, modification of interfaces, and conflicts between user demands will need to be addressed by SS&M."
SS&M is unfair: necessary information is not available and the original developers are usually long gone.	Most IT governance structures let the systems design teams normally consult with users but not the SS&M staff.	"The development/adoption team emphasizes the logic of business flows. Although they consult with the users, they seldom work with the SS&M team in the systems development stage."
SS&M is no-win: people only want problems solved.	SS&M is not just about trouble shooting, but equally importantly about diagnosing changes in the business environment.	"Systems support and maintenance is not only about the protection of existing enterprise value but it is also the 'radar system' detecting changes in the business environment. When the external environment changes, the enterprise strategy and operation will need to react to it. Information systems link closely with all the business flows. Therefore, changes in business operations cause conflict with the existing information systems."
SS&M work does not result in glory, noticeable progress or chances for 'success'.	SS&M has the reputation for being somewhat boring, but in fact, it is interesting and challenging and provides significant value to the business.	"Adoption and SS&M are of equal importance and the global CIO/CEO considers good SS&M to be a basic requirement. In fact, the SS&M team knows the whole picture of corporate functions/ strategies better than the adoption team as they are facing the users and hosting the corporate datasets used for multinational operations."
SS&M lives in the past. The quality of yesterday's development work is often poor.	Good IT governance should emphasize the creative and innovative feedback from the SS&M team for systems upgrade, integration, and future projects.	"Through SS&M, IT staff are able to sense the pulse of the business." "The SS&M team often creates effective support tools that are not considered in the adoption phase, e.g., log tool, alert systems, control systems for production machines etc."

Perhaps the most pronounced change is that the practitioners in these giant multinational enterprises perceive SS&M as much more than just a technical service. While Edwards (1984) pointed out that SS&M was a critical, if unnoticed, part of the IS development process, and El Sawry and Nanus (1989) recognized that SS&M was tending to get 'traded off' in favor of system development, our participants make a strong case for the critical role of SS&M within the business as a whole. They repeatedly state the role of SS&M in supporting the business. This is of course done through the updating and modification of systems based on user input – including those involved in strategizing around the wider business environment.

joint performance measurements for these two groups. Some of the interviewees are aware of this situation but there does not seem to be any referential solutions from the literature for them. This is perhaps to the detriment of the whole organization. On the other hand, most CIOs admit that systems development teams normally consist of participants from other departments, who gain credit more easily than the SS&M teams. That is, SS&M teams in most enterprises still solve the problems left during the systems development period but they do not get the major recognition and lack appropriate key performance indicators to evaluate their work after a systems project is implemented. While some of the CIOs mentioned they encourage the SS&M teams to provide

innovative ideas and suggestions to the front end users in various functional departments for both systems improvements and business process improvements, there is a need for certain IT governance mechanisms as incentives for such practices

The Attributes of IT Governance Contributing to Effective SS&M

Most of the CIO participants strongly concurred that more attention was needed in SS&M from the top management, not just requirements and expectations but resources, support, and recognition of the team's efforts and the potential value. When asking whether the enterprises encourage their SS&M teams to provide innovative ideas and solutions to the users, six participants' answers were positive and three of them said that there are either documented policies or unofficial feedback to those who could provide ideas and contribute extra value. One of the remaining two participants was neutral on this. The other is an exception and was negative about the idea. As a CIO, his philosophy is to be conservative and expect the IT staff in SS&M to simply follow the standard operating procedure.

They also confirmed that most academic theory was related to systems adoption and there is a lack of theoretical models they can refer to for SS&M governance. That is, they have built up the IT governance structure for SS&M activities through experience rather than from the literature. At least three participants mentioned that the SS&M team normally comprises several groups when the business scale increases to multinational level. There will then be decisions made about the organizational capability for the SS&M team – whether it should be centralized or distributed, and how many tiers of services should be formed.

As described by the Senior IT Manager of F company, "While the data maintenance is centralized in our headquarters, there are distributed SS&M teams serving the worldwide sites. Additionally, if a subordinate keeps a level of operation scale with multiple functions (such as manufacturing, sales, and procurement), we will set service teams into 2-3 tiers to fulfil the needs of desktop support, infrastructure maintenance, and control of business flow and data warehousing. Such a concept is mainly developed based on our own experiences or learned from other companies in this industry."

One participant anticipated that theory development in IT governance for SS&M could be difficult as it was often in reaction to a wide range of emerging business, environmental and technical issues. However, most participants could easily list a wide range of attributes they would like to see further investigated. These are collated and summarized in Table 3 based on the major organizational capabilities of IT governance suggested by the literature including technical capability, resource capability, organizational capability, business process, and the potential to contribute extra value to the enterprises (Wilkin and Chenhall 2010).

Table 3 Capabilities of IT Governance for SS&M

Areas for Attention	Attributes
Technical Capability	Technical skills training and documentation Data consistency, protection, quality, and maturity Techniques in problem detection and analysis Technical plans to tackle differences between SDLC and real scenarios
Resource Capability	Budget planning and cost control Resources for multi-site SS&M teams Resource capability for emergent issues and business changes
Organizational Capability	Performance measurement IT staffing and training Structure of SS&M team and outsourcing decisions
Business Processes	SS&M documentation Process of SS&M control and decision making Auditing for maintenance activities
Value Creation	Maintaining knowledge of maintenance Investigation of key business value through SS&M Data mining, knowledge management, and the association rules of problems

The areas in which the participants would like to see more academic knowledge developed mirror the areas that they mentioned in the section above on IT governance and SS&M. They want and need more practical and theoretical guidance and support from academia with the issues that they are experiencing at the coalface. Participants seem to believe that research in these areas will lead to an increasingly sophisticated approach in both technical and management skills. The result should help future IS managers to plan and control SS&M activities more effectively to ensure information management capability and that it is better integrated into the overall business strategy and enterprise performance as suggested by Mithas et al. (2011).

Conclusions

As understood by our senior level IS-based participants, SS&M clearly matter to organizations and IT governance plays an important role in the effectiveness of SS&M operations. In our participants' views it is a critical and undervalued link between the business and IT sides of the organization. It is potentially a source of organizational innovation and knowledge. However, in practice SS&M might not be well integrated into either the IT side or the business side of the organization and its value as a potential link is under-utilized. Part of this neglect may be due to the

inherent drawbacks of SS&M as Glass and Noiseux espoused back in 1981. SS&M is expensive and if realistically accounted for upfront in the SDLC is a potential deal killer. SS&M also still appears to be unglamorous, bearing the brunt of blame when things go wrong, and little of the kudos when they go right. These issues tend to reflect a lack of awareness of the potential value of SS&M on the part of senior management, particularly on the business side.

Our participants' stories tend to confirm this and if we are to believe them, SS&M has many potential areas where it can help the organization. However, without recognition of such value, IT governance focusing on SS&M and research that they can work with, the odds are that the situation may not change much for many years to come. As far as we could ascertain, very few studies in the area of SS&M consider integral governance aspects of the organization and business processes along with SS&M services after enterprise wide systems are deployed. Therefore, we would like to get the ball rolling and issue a call for academia and business to develop an agenda for research in IT governance on SS&M. Table 5 provides a good starting point for research. One example is exploration of the resource planning and control mechanism of IT governance for multinational enterprises and its relationships to SS&M.

Some key areas to focus on could include a governance framework for SS&M that incorporates frameworks for operational and business control and decision-making. These could include cost/benefit analyses for various approaches to SS&M, benchmarking and auditing procedures that can account for the full gamut of SS&M-related activities as discussed by our participants including aspects not generally considered part of SS&M such as business intelligence and knowledge management. Another example could be the impacts on IT governance, SS&M, and business operations when adopting new technology such as the post Radio Frequency Identification (RFID) adoption in a context of multinational enterprises.

As evidenced by our participants' comments we believe that business will warmly embrace a cooperative research agenda with academia. Over time, increasing our understanding of IT governance issues and their current and potential roles in the SS&M activities should go a long way to improving enterprise performance since it is a critical component of information management capability (Wilkin and Chenhall 2010). We see a tremendous amount of research potential, particularly linked with the continuous technology development and business changes that could affect IT governance and subsequently the efforts of SS&M. In the near future, we hope to see more studies and investigations on this topic, and in business, recognition of the important, often critical role that SS&M of enterprise systems plays in the post-adoption stage.

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EVALUATION FRAMEWORK FOR E-GOVERNMENT SERVICE DELIVERY IN A THAI CONTEXT – A research in progress

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ABSTRACT

The study aims to identify an evaluation framework and a measurement tool for e-government service delivery. E-government and e-participation initiatives are created to facilitate public administration and the political processes. Both initiatives are produced and presented on the same government websites. However, the evaluations are operated separately. Construct Development Methodology, a scale development for IS research, is applied. The review and adjustment of the DeLone & McLean Information System Success Model 2003 demonstrated the ability to add a variable to capture the essence of a phenomenon. The tool contributes to a better understanding of the evaluation of e-government service delivery.

Keywords: e-government service delivery, e-participation, scale item development.

Introduction

The measurements of e-government services and e-participation are performed separately even though they are presented on the same government websites for the same citizens. The evaluation of websites can assist both e-government services and e-participation to provide better quality services and fulfill the needs and requirements of citizens [26]. The research question is what is a suitable measurement tool for e-government service delivery that covers information provision, government services and citizen participation in a Thai context?

Traditionally, citizens have to visit government offices during office hours to request and obtain information and services. When information and communication technology (ICT) is adopted, the government offers information and services through websites as an additional channel of service delivery. Barriers of location and time are eliminated. Information and services are available round-the-clock (24/7), and citizens are able to access government services from anywhere. The demands and priorities of citizens have changed [1].

Government is under pressure to evaluate the development of e-government initiatives and citizen participation through government websites as stated in the Royal Decree for Criteria and Procedure for Good Governance 2003 [30]. The improvement of government service delivery and the rise in urban populations have driven government to cope with intensifying demand in cities and local communities. Government services have shifted from a global agenda to a local schema [1]. The government has to manage changing requirements by improving its services to the public.

Scale development method is employed to explore a framework and a measurement tool for e-government services. The definition of e-government services is sought and rearranged to focus on the use of ICT as a tool in e-government and cover e-participation initiatives. The expected result is a measurement instrument which can be applied to evaluate government websites in a Thai context. The findings contribute to a better understanding of the assessment of e-government service delivery in a Thai context.

Evaluation of E-government and E-participation Initiatives

The electronic government (e-government) initiative was initiated to take care of ICT related matters including implementation, monitoring, and improvement of government service delivery. Benefits for Thais are an increase in the efficiency of the administration of government agencies, reduced cost and increased national competitiveness [2] [27] [28].

Thailand added ICT into the Public Sector Reform Plan in 1996 to increase the efficiency and effectiveness of public administration. In 2002, the Ministry of ICT was established to manage ICT-related matters including e-government initiatives. Several ICT plans, short-term and long-term plans, are produced to guide and manage public administration and e-government projects [27] [28] [29].

The evaluation methods for traditional services, such as the Baldrige criteria (Malcom Baldrige National Quality), the Balance Scorecard and ISO (International Organization for Standardization), are rarely applied to e-government service delivery [16].

An “off-the-shelf” tool to measure e-government is not currently available. A number of new instruments have been produced to measure e-government services such as the Citizen Satisfaction Model (CSM) [16], Website Quality [3] and the Stage Model [15] [18] [36] [37] [38].

Like the e-government initiative, the electronic participation (e-participation) initiative was established to increase the ability of citizens to participate in the political processes and transform digital government information and services [33]. The focal point remains the ‘citizens’, similar to e-government initiatives.

The evaluation of e-Participation, on the other hand, is assessed separately from e-government services. For example, the United Nations has included an E-Participation Index in the UN e-Government Survey since 2003 [36] [37]. Current studies about e-participation are at an early stage including

research studies in Thailand. The foci are in determining an evaluation framework [12] [21] [22] [23], the actors involved in the participation process, the effects of e-participation [33] and the application of electronic tools to support e-participation [14] [15] [41].

Table 1 Disadvantages of the current measurement tools for e-government and e-participation initiatives.

Methods	Disadvantages
<ul style="list-style-type: none"> - Quantitative evaluation of e-government services and e-participation - Financial terms - Benchmarking - Website Quality - Stage Model - E-government Readiness Index (part of the UN E-government Survey) - E-participation Index (part of the UN E-government Survey) 	<p>Supply side focus</p> <ul style="list-style-type: none"> - Intra-organization usage [24] [40]. - Difficult to evaluate intangible assets [40].
<ul style="list-style-type: none"> - Website Quality - Stage Model - Quantitative evaluation of e-government services and e-participation 	<p>Technology focus</p> <ul style="list-style-type: none"> - Site-centric approach [19] [25]. - Focus on strategic direction of technology perspective [5].
<ul style="list-style-type: none"> - Stage model - Citizen Satisfaction Model (CSM) 	<p>Progression and benefit realization</p> <ul style="list-style-type: none"> - Strictly linear path progression [5]. - Benefit realization is related to maturation [5].
<ul style="list-style-type: none"> - Benchmarking - E-government Readiness Index (part of the UN E-government Survey) - E-participation Index (part of the UN E-government Survey) 	<p>Do not support local contexts</p> <ul style="list-style-type: none"> - Snapshot or brief evaluation [36] [37]. - Comparable within groups [32] [36] [37] [38].

The current measurement methods have some disadvantages in that they are unable to capture the actual meaning of e-government service delivery (see Table 1). The characteristics of the disadvantages allow categorization into four groups; supply side focus, technology focus, progression and benefit realization, and do not support local contexts.

Predominantly, the measurement methods have been invented by service providers [24] [40]. The objective of suppliers is to focus on the contentment of owners and

stakeholders. Financial measurements are related to organizational strategies and objectives. The results are used internally and presented to top management to guide decision-making processes and the reinvestment scheme. The nature of financial terms is easy to understand. However, it does not offer an adequate picture of the organization performance. The impact of ICT usage is considered an intangible asset. Measuring an intangible asset is not possible using financial terms [40].

The development and expansion of ICT is evolving, dynamic and changes on a daily basis. Brown (2007) found that technological advancement does not appear to follow the hierarchical path of the stage model, also known as the maturation model. The business sector is able to closely follow developments and is willing to take investment risks. The government normally is not a leader in employing newly developed technology and is unable to take any risk on behalf of its citizens. The stage model is useful in identifying the requirements of IT and composing strategies for technology usage. However, technology development and usage in any measurement model should be neutral. The evaluation should be able to reflect the users' feedback without any interference from technological advancement and development [5].

For the stage model, maturation is reached when all stages are completed. There is no rule about how long it takes to accomplish each stage and obtain maturity. The time maturation takes for each website is not the same and cannot be calculated [5]. The growth of e-government development tends to be slow. The benefits are expected to be fully recognized when reaching the highest stage. Services that are related to the political processes such as voting and consultation are normally in the later stages of development. If a government website does not progress to the later stage, users will not be able to exercise their democratic activities. However, Brown (2007) found that the benefits are not necessarily related to maturation. Benefits are perceived to be appreciated when information and services are adopted at any stage.

E-government and e-participation initiatives have become global agenda where the governments have invested more and more and expected even more from ICT usage. Comparisons using benchmarking approaches are widely used and well-accepted such as the United Nations (UN) E-government Survey, Accenture, Brown University, and the Economist [4]. The UN E-government Survey provides a standard measurement method which is set and applied with its member states providing a snapshot of the e-government initiatives of member states. Each country has to decide upon its development framework and the extent of the e-government initiatives. The local contexts remain the local provision [36, p.9].

The review leaves a question of what is a suitable measurement tool for e-government service delivery that covers information provision, government services and citizen participation in a Thai context.

An appropriate definition of “e-government services” is sought to emphasize the use of ICT as a tool to facilitate government services and encourage citizen to fulfill their obligations. E-government in this study refers to “the use of ICT and electronic means in public administration for the provision of information and public services to the people, and to increase citizens’ abilities to participate in the political processes”. The definition is applied to evaluate the success of e-government and e-participation initiatives together.

Citizens and Government

Learning from the success in the business sector, the government adopts evaluation methods and employ to assess its success. However, citizens and customers are different identities with different requirements (see Table 2).

Table 2 Characteristics of customers and citizens [35]

Customers	Citizens
<ul style="list-style-type: none"> • Businesses are geared towards getting loyal customers • Customers have more choices of supplier • Businesses have no power over customers • Customers and suppliers or organizations are separate identities. 	<ul style="list-style-type: none"> • Remain citizens no matter how they behave • Limited choices • State has a huge amount of power over the citizens. • State and citizens depend on each other.

Customers are the key to success in the private sector; a business tends to gear its organization to the preferences of the customers. An organization that can satisfy its customers tends to be successful and generate more revenue and profits. Customers are able to choose the best suppliers available to them. A supplier that offers the best deal is likely to win the customers. Customers have a large amount of power over the organizations. Customers and organizations are separate identities [35].

Government is unable to discriminate against any citizens. Information and services are available to all. Citizens, on the other hand, are unable to choose the best available suppliers. Government is the only service provider for government services. Government has power over citizens in terms of providing information and services. Government and citizens depend and rely on each other [35]. They are inseparable.

A government website is capable of offering e-government services and e-participation for the same group of users, ‘citizens’. The website can support the roles of citizens and the obligations of government electronically. The role of citizens is to expect services from government ranging from information provision and transactional and non-transactional services to decision-making consultation and voting. Citizens are being served and regulated by the government. Citizens have duties as voters, influencers, use-clients, and general-clients (see Figure 1) [13].

Citizens have moved from passive roles to be advisors and influencers of government. ICT has enabled citizens to acquire “online” services through government websites without having to ‘wait-in-line’. Citizen participation is a vital part of Thai public administration. Citizen participation is included in a number of government initiatives and plans such as the Royal Decree on Criteria and Procedures for Good Governance (2003) [30], the Public Sector Reform Initiatives [29], IT 2010, ICT Master Plan 1 and 2 [27].

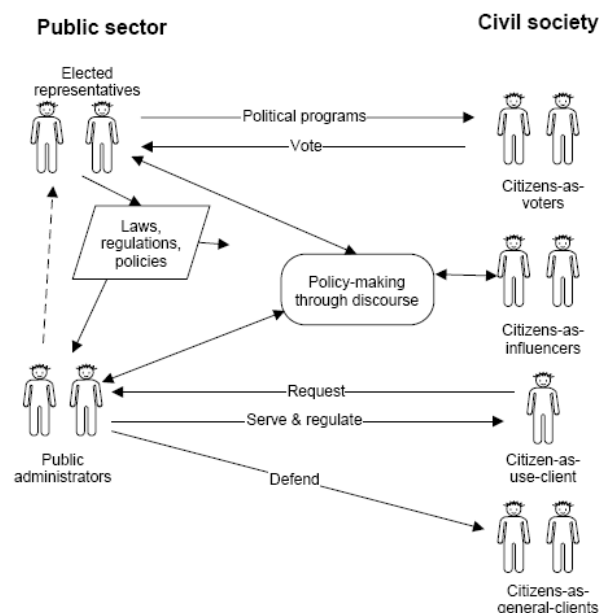


Figure 1 The citizen’s roles in relation to civil society and the public sector [13]

Citizen inputs, ideas, and experiences are used to facilitate the improvement of public administration, and enable the political processes in consultations and decision-making. Quality of participation through ICT usage is an important aspect that assists the involvement of citizens in the political processes.

Research Framework

The nature of e-government services and e-participation studies are eclectic research. There are no well-developed theories and methods. The different disciplines, fields and researches are brought together to complement research study, such as political sciences, public administration and sociology [33]. E-government and e-participation initiatives have IS characteristics, and knowledge of the IS field is necessitated. The IS Success Model is widely accepted and is a validated representation and explanation of the IS use phenomenon [24]. The success of an IS usage requires the evaluation of IS practices, policies and procedures with IS success measures [8].

The DeLone & McLean IS Success Model (D&M IS Success Model) has been applied directly and with extension in online assessment especially e-commerce, e-business and e-government [34]. It is one of the most popular models and is widely applied in the IS research field [31]. The first D&M

IS Success Model was created in 1992 and has been extensively used in IS researches. The model consists of two independent variables; Information Quality and System Quality, and 4 dependent variables; Use, User Satisfaction, Individual Impact, and Organizational Impact [8]. The relationships among dimensions and measures are heavily examined and confirmed as a combination of causal and process structures. The D&M IS Success Model is able to evaluate system creation, use of system and consequence of system usage [9] and capture the service delivery process from service provider in preparation, users' consumption and their realization of benefits. Each step is interrelated [8] [9] [10].

The IS practices have changed dramatically since 1992 due to extensive IT development. Internet connection and World Wide Web technology have given more alternatives for business achievement. Not only are products bought and sold online, but services are offered through commercial websites. The role of an organization has transformed from only information provider to information and service provider. The D&M IS Success model was reviewed and revised in 2003. "Service Quality" is included as the additional independent variable to the construct to capture the characteristics of service delivery and the changing roles of IS. Two dependent variables, Individual Impact and Organization Impact, were combined and called 'Net Benefits'. Researchers are able to detail the level of impacts for their studies within their context [8] [9]. The extension of the 1992 model has shown two possibilities; (a) to add more variables to the model within the context of a study, and (b) to define the Net Benefits to suit the study.

A few researches utilize the D&M IS Success Model to assess the success of e-government initiatives. For example, Xuetao Guo and Jie Lu used the model to evaluate e-government online services in Australia to identify the effectiveness of websites [15]. Sivaporn Wangpipatwong, Wichian Chutimaskul, and Borworn Papasratorn (2008) applied the D&M IS Success Model 1992 to evaluate the e-government websites of the Thai government. The results showed that 'continue-to-use' behavior of individuals may indicate a high level of satisfaction. User satisfaction is high if System Quality and Information Quality increased [39].

The D&M IS Success Model 2003 is selected as an initial framework to measure e-government success. The model originally comprised three independent variables; Information Quality, System Quality, and Service Quality [10]. Information Quality captures content issues and measures the success of the information in transferring the intended meaning. It is measured as an output of information systems [10]. Information dissemination is an important element of government. System Quality is applied to evaluate the desirable characteristics of IS [31]. System Quality measures the accuracy and efficiency of the communication system that produces information at a technical level [10]. Service Quality means the quality of the support that system users receive from the IS department [31].

The study proposed to add one dimension, 'Participation

Quality' (see Figure 2), to capture the essence of e-government service delivery. Participation Quality refers to the ability of online services of government agencies to support the democratic process including e-voting and e-decision-making [23]. The measurement of participation is extended to the ability of citizens to be involved in the political processes and the transformation of digital government information and services [33].

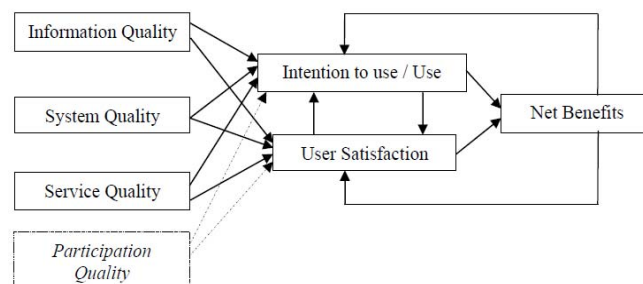


Figure 2 The proposed model with an additional an independent variable: Participation Quality

The extended construct is used as an initial framework to measure e-government service delivery. List of item stems and item statements are investigated and filtered in the scale development process. The developed framework incorporates the unique roles and responsibilities of citizens and the government. The success of government, in other words, depends on citizen perspectives of government works and public administration.

Research Design and Method

The study applies the scale development to determine a proper framework and measurement instrument for e-government service delivery. The design of scale development comprises a qualitative method and is followed by a quantitative method. The exploration of a qualitative method is required in order to search for a framework and build a draft instrument. The draft instrument is employed to create a questionnaire and the questionnaire is applied in the quantitative method. Users are invited to answer the questionnaire and the results are analyzed [7].

The examinations of current government websites were performed prior to the instrument development procedure. The aim is to search for an existing online survey and other evaluation tools presented on government websites. Websites at ministerial and departmental levels are randomly chosen and investigated for the presence of evaluation tools. Questions in the existing survey are explored if the requirements in the Royal Decree on Criteria and Procedures for Good Governance (2003) are included: the information of respondents, the quality of services, the level of satisfaction and the impact of value for money [30].

The Construct Development Methodology is a scale development for IS research. It is applied in this study to search for a framework and craft a measurement tool [20]. The method consists of three stages; Domain, Instrument, and Measurement Properties (see Figure 3). A measurement

framework is identified in the first stage using content analysis. Various techniques are utilized such as a literature review, online databases, government documents and related journals. A framework is selected together with a list of dimensions, item stems and item statements.

The D&M IS Success Model (2003) is identified as an initial framework for instrument development. Factors influencing the delivery of e-government services are explored, such as the roles of citizens and government officials and citizen participation. The additional dimension, "Participation Quality", is proposed as an additional dimension to evaluate e-government success. The indicators of each dimension are examined as well as indicators of participation quality.

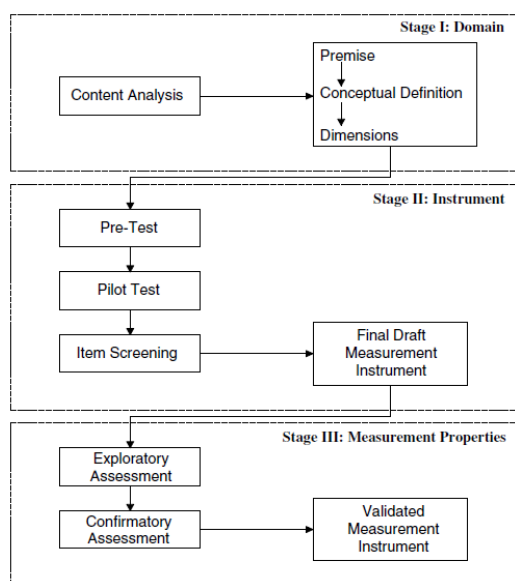


Figure 3 Construct Development Methodology [20]

The second stage involves a pre-test, a pilot test of the survey and the screening of item stems. A draft instrument is obtained with a set of questionnaires. The questionnaire is applied with pre-specified samples to test its reliability and validity. Data are collected and analyzed using Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) [20]. The final result is a validated measurement instrument for e-government service delivery in a Thai context.

Examination of Thai Government Websites

The aim is to investigate if there are any online surveys presented on Thai government websites to elicit users' opinions in regards to e-government services. Sixty websites in departmental (40) and ministerial (20) levels were selected and searched for online surveys from 1-15 October 2010. The search was performed 5 times within the 15 days.

The result showed that 25% provided online surveys which were presented on the first page as a web banner. Users can click the banner to access and answer the survey. The questionnaire comprises information about the respondent and the level of satisfaction on the design, information, system, usage, repeat usage and benefits. The scale ranged

from 1-5; from highly dissatisfied to highly satisfied. 27% used 'quick polls' asking users about their satisfaction on e-government services.

An emerging finding is that a number of electronic tools (e-tools) are applied on government websites. Samples of e-tools are e-newsletters, Facebook/Twitter, news and announcements, Frequently Asked Questions (FAQ), search engines, suggestion boxes, and web boards. E-tools are divided into three groups; basic tools to support e-participation (FAQ, e-newsletter, search engines), tools used in e-participation but not specific to e-participation, and core e-participation tools [17]. The study has shown that e-tools can be shared between e-government and e-participation initiatives.

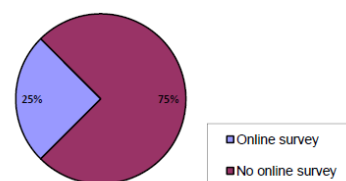


Figure 4 Percentage of government websites with and without an online survey

There is no general survey for any government agency and the results are not comparable. The results from this examination support the need to find a proper tool to evaluate e-government services generated in accordance with e-government and e-participation initiatives.

Domain Specification

Stage I, Construct Development Methodology, is involved in the development of constructs and the selection of a suitable framework. Content analysis is applied to search for a suitable framework, list of dimensions, item stems, and statement items. Item stems are the theoretical sub-part of dimensions. Name of item is a 1- to 3- word phrase that describes a part of a dimension. A dimension comprises as many item stems as necessary to represent a single dimension [11]. Keywords are related to e-government, e-participation, and scale item development.

Table 3 List of Item Stems

Information Quality	System Quality	Service Quality	Participation Quality
Accuracy	Dependability	Assurance	Access
Completeness	Ease of use	Empathy	Accountability
Privacy / security	Efficiency	Reliability	Contestability
Relevance	Functionality	Responsiveness	Equality
Timeliness	System availability	Tangibility	Openness
Understandability	Usability		Transparency
	Usefulness		

Item stems derive from the literature review; journals and documents in online databases, government documents and

reports, and online research papers from internal organizations [11] [20]. The library of Dhurakij Pundit University provides online databases from international subscriptions; for instance, ABI/INFORM Global, and Science Direct. Government documents can be searched and downloaded from the websites of the National Electronics and Computer Technology Center (www.nectec.or.th), the Office of the Public Sector Development Commission Thailand and the Office of Civil Service Commission. Samples of reports of international organizations are downloadable from the websites of the United Nations Public Administration Network (www.unpan.org), the European Union (<http://ec.europa.eu/>), and the International Telecommunication Union (<http://www.itu.int>).

The D&M IS Success Model is applied in the e-government environment. Net Benefits can be identified within the e-government initiatives [10]. Item stems for Net Benefits derives from the exploration of government documents; IT 2010, ICT Master Plan 1 and 2, and the Royal Decree on Criteria and Procedures for Good Governance (2003) [27] [28] [30]. List of item stems are better quality (increased efficiency), good governance, high performance (effectiveness), save cost (value for money), respond to needs, enhance participation, and transparency.

List of item stems and item statements are employed to shape a questionnaire and to test pre-specified samples in Stage II. After that measurement of properties is performed in Stage III to assess the websites of Thai government agencies.

Conclusion

The study allows the better understanding of the measurement of e-government services that include information provision, government services and the ability of citizen to participate in the political processes. The examination of Thai government websites reconfirmed the necessity of searching for a suitable tool which captures the essence of e-government service delivery in a Thai context.

E-government and e-participation initiatives share some similarities in using ICT as a tool to enhance public administration and the political processes. Government services are offer via government websites for all citizens and share some of the electronic means to improve public administration. Government and citizens hold unique roles and obligations, different from the business sector and its customers.

Providing e-government services involves with the IS procedures from production, consumption and benefit realization. IS Success Model is suitable to use as an initial framework to assess e-government service delivery. Roles and obligations of citizens and the government are included. The new measurement instrument can be applied in a Thai context.

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LOCAL SERVICES THROUGH E-GOVERNANCE IN NEPAL: AN ASSESSMENT OF MUNICIPAL WEBSITES

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ABSTRACT

This paper presents the explanatory analysis of municipality's e-governance project in Nepal. Objectives of e-governance projects were to improve administrative processes, connecting citizens and building external integrations. This study attempts to provide deeper insight to e-government landscape at local level in Nepal. Website of each municipality was assessed on its usability, navigability, trust and credibility and its legal policies. The promptness in service delivery was measured by email responsiveness to the user's questions. E-readiness and Nepal government's master plan 2006 has also been considered in assessment of local e-governance. The assessment of websites indicated its under-utilization as an e-government tool and a very minimal adoption of e-governance. Result clearly showed lack of transparency, slow service delivery and under estimation of existing websites by government. This study suggests that government need to work seriously and extensively hard to achieve the benefits offered by ICT. This paper has identified some important factors which can improve the success of local government's website. This study might prove useful for other developing countries with similar initiatives.

Keywords: e-governance, citizen participation's, ICT, web usability, municipality

INTRODUCTION

With increasing power of ICT in governance, the concept of electronic governance is taking shape in the world today. E-services provided in the e-government portals around the world are increasing. Improving administrative processes, connecting citizens, building external interactions and addressing accessibility, transparency, participation and accountability have been keys to e-governance today [1]. ICT initiatives have been highlighted as effective tools in bringing the promises of changing structure, accomplishing public sector reform and enhancing outside reach that satisfies development requirements and contribution to the country's economic growth [2]. Urban region development is increasing area of concern for government in all nations. With urban settlements growing rapidly, it is becoming a challenge for urban municipality to meet the ever

growing need of the people [3]. The impact of electronic based system like e-governmental portals has been visualized as the aspect that contributes to meet the increasing need of the people in urban areas. Globalizations, increasing ICT uses and faster service delivery have enforced municipalities to adapt and follow new methods and planning in e-governance.

Local e-government is about 1) Transforming services 2) renewing local democracy and 3) Promoting local economic viability [4]. Interim constitution 2007 [5] of Nepal part 17, article 139 clearly includes a separate section on local self government. It mentions services to the people at the local level, providing platform for people's maximum participation in the country's governance, and for the institutional development of democracy. Hence local government should be very effective to disseminate the information to public people.

Kaylor, Deshazo, and Van Eck (2001) had identified twelve functional dimensions of local e-Government services and functions. Some of them are payments, registration, permits, and licenses available to the user online. Also since government surpasses all sectors in society unlike other service offering, e-government local services must be made accessible to all, which means every citizen with varying capability should get the opportunity to use the government's services [6].

COUNTRY PROFILE

Nepal, officially known according to its Interim Constitution as the Federal Democratic Republic of Nepal is a landlocked Himalayan country in South, bordered by China to the north and by India to the south, east and west. The country has total area of 147,181 Sq Km and an estimated population about 29.8 as of 2010. The adult literacy rate of country is 59 % and GNI per capita is \$490[1]. According to UN e-government survey 2010, e-readiness index of Nepal is 0.2568 and is ranked 153rd. Internet user per 100 inhabitants in Nepal is 6.78 as of 2010[7]. Fixed broad band subscription as of 2010 is 113,485 i.e. 0.38 of 100 inhabitants.

CONTEXT

Many different initiatives have been taken by the government of Nepal to make the web presence for all municipalities. Some of the municipalities in Nepal have their own web

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presence. Those websites provide minimum level of information about the municipality. Government of Nepal through its strategies under Ninth five year plan on 2003, through rural urban partnerships program (RUPP) took the first initiative to help all municipalities for their web presence. RUPP was a joint effort of Government of Nepal - National Planning Commission (NPC), Ministry of Housing and Physical Planning (MHPP) and Ministry of Local Development (MLD), United Nations Development program (UNDP) and United Nations Centers for Human Settlements (UNCHS). RUPP supported 12 municipalities in its commitment to e-governance. Aligned with IT policy of Nepal 2000 section 5 [8], 16 municipalities in Nepal have now their web presence. Research done at the time of this study showed that most of the municipality's websites are under construction or have programming errors displays or have server down. Out of the 12 municipal websites supported by RUPP, only 2 of them are accessible on August 2011. This is an embarrassing condition of e-governance in country. However on 2010, 5 of the websites were accessible.

The objective of this study is to learn the extent of governance and services offered to citizens' at the municipal level in Nepal. The focus of this study is the objective analysis of accessibility and usability of the municipal websites. This study conducts a deep and comprehensive investigation of contents and information in those websites.

METHODOLOGY

Parameters as suggested by Holzer and Kim for evaluating city and municipal websites [9] have been considered for the measurement of the websites. Mixed evaluation approach [22] has been performed on all accessible websites to do the objective analysis of the websites. The mixed evaluation approach is the measurement in percentage of usability, navigability, legal policies and trust and credibility of the websites. Usability of the websites was measured in terms of content organization, browser compatibility, familiarity and affordance, visibility, alt tag of non textual contents and availability of zoom options. Navigability was measured in terms of presence or absence of search input box, broken links, sitemap, bread crumb and availability of help and FAQ in the websites. The trust and credibility was measured by considering up to date information, authorized email contacts, and mark up validation of the sites. Legal policies were measured by considering presence or absence of privacy policies, disclaimer and copyright info in the websites. Online available tools like w3c validators [10], websites goodies

[11] and the coding techniques [21, 22] have been used to do the objective measurement.

Responsiveness of the websites was measured by following West 2000 process [12] in which emails was sent to all 16 municipalities and results were analyzed. The email address of each municipality was obtained from the contact information provided in the websites. Email was sent with the question " Can you provide me information about birth registration process?" to measure promptness and alertness in responding to the public questions by the municipalities.

Finally, *e-readiness* and *Nepal e-governance Master plan 2006* were used as an assessment tools. " E-readiness is the ability to use information and communication technologies (ICT) to develop one's economy and to foster one's welfare." [13]. Basically, five primary indices viz infrastructure, ICT sector, digital skills, legal framework and usage define a country's ICT infrastructure capacity [14].

Nepal e-governance master plan 2006 is the realization of potential and implementation of ICT by Nepalese government for socio-economic transformation. With the introduction of first computer in 1971, followed by National Computer Center (NCC) in 1974, government has been planning on ICT as initiatives to rapid development. High Level Commission for Information Technology (HLCIT) and the National Information Technology Center (NITC), two government bodies, supported by Korea IT Industry Promotion Agency (KIPA) have worked on Nepal e-governance master plan 2006. To further the master plan, e-government working committee consisting of ICT professionals and steering committee consisting of the joint secretaries of the Prime Minister's Office (PMO), the Ministry of General Administration (MOGA), the Ministry of Information and Communication (MOIC), the Ministry of Environment, Science, and Technology (MOEST), the executive director of NITC, and full time member of HLCIT have been formed. With e-Government master plan development project officially started on 28th February 2006, the project was divided into three phases -"As is Analysis", "To-be-Model", and "Establishment Plan". Nepal government status report showed Nepal to be at stage 1. The result was obtained, according to the five promotion stages specified by the UN and the American Society of Public Administration (UN-ASPA, 2002) and thus road map was produced to reach at stage 3 on 2011 [15].

RESULTS

The E-government websites should be up to

Ananta Raj Lamichhane and Rabindra Acharya date, correct and effective in every aspect [16]. At the time of study 12 websites were found to be accessible. Other websites were having server down or inaccessible error. Upon analysis of those 12 municipality' s websites, it is found that none of them meets usability and accessibility standard.

Overall evaluation showed that Kathmandu, Bhaktapur and Bharatpur Municipalities websites have comparatively higher scores than others while Prithivi municipality scored the lowest. All evaluated municipalities show fairly same degree of usability and accessibility percentages. Bharatpur and Kathmandu municipality scored best on usability and navigability respectively. On trust and credibility Dharan has the highest score and Nepalgunj, Bharatpur, Bhaktapur, and Hetauda have fairly good scores. No true legal policies were found on all evaluated websites.

Overall none of the websites scored over 60% in its evaluation. The website with usability of more than 80% is assumed to be usable [22]. The results of the analysis are summarized in figure 1.

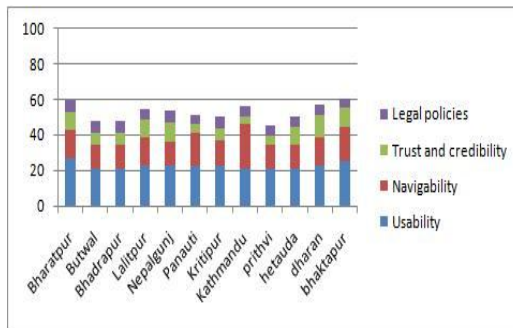


Figure1. Features comparison of municipalities websites in Nepal in percentage

Figure 2 presents our detail analysis of the websites in terms of different parameters. None of them are usable in delivering the e-governance services. Lalitpur and Nepalgunj possess slightly higher score in terms of familiarity and affordance. None of the websites offer zoom option for visually impaired users. However, comparatively few broken links were found. Lalitpur and Dharan contained sitemap feature while FAQ and help information were lacking, which is very important for the websites usability. Nepalgunj, Bharatpur, Hetauda and Dharan have up to date contents compared to other websites. Among all, only Dharan provides the organized authorized email and contact. All the websites except Panauti and Bhaktapur have copyright information while all the websites lack privacy policy and disclaimer information.

Popularity of websites was measured by using Alexa [17] online tools. It showed Kathmandu municipality was ranked within top 500 whereas

others were ranked below 500 among the websites in Nepal. This proves that municipality' s websites are not popular in Nepal.

The results of the experiments conducted for the measurement of responsiveness are presented in the figure 3

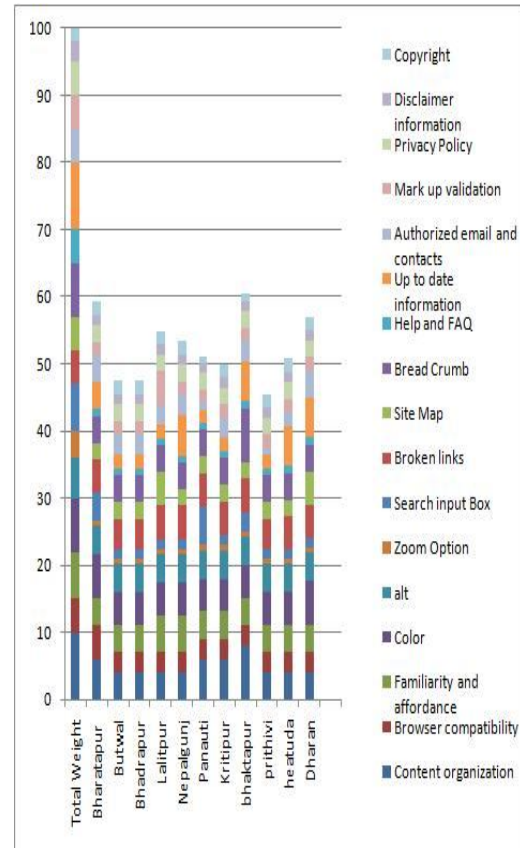


Figure2. usability and accessibility evaluation of municipalities websites in Nepal in percentage

Municipalities	URL	Status
Bhaktapur	http://bkt-municipality.gov.np	Replied within One day
Bharatpur	http://bharatpurmun.org.np/	Email Not responded
Bidur	http://www.bidurnagar.org/	No Email address
Biratnagar	http://www.biratnagararmun.org.np/	No Email address
Butwal	http://www.butwalmun.org.np/	Recipient failed
Dhangadi	http://www.dhangadhi.org.np	No Email address
Dharan	http://www.dharan.gov.np/	Replied within 3 hrs.
Hetauda	http://www.hetaudamun.gov.np/	Replied within One day
Kathmandu	http://www.kathmandu.gov.np/	No Email address

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Lalitpur	http://www.lalitpur.org.np	Recipient failed
Mahendranagar	http://www.mahendranagar.org/	No Email address
Nepalgunj	http://www.nepalgunjmun.gov.np/	Email Not responded
Panaudi	http://panautimun.gov.np/	No Email address
Prithivi	http://www.pnmgorkha.gov.np/	No Email address
Tansen	http://www.tansenmun.org.np/	No Email address
Kirtipur	http://www.kirtipur.gov.np/	Recipient failed

Figure 3: the results of experiments on responsiveness

The result in figure 3 shows that only Dharan, Hetauda and Bhaktapur municipalities answered the email promptly. The email replied by them clearly addressed the answer of the question. The email was successfully sent to Bharatpur and Nepalgunj municipalities but no response was received, while other websites either have email bounced back or the recipient failed error.

DISCUSSION AND CONCLUSION

The result of assessment of municipal websites shows that none of them offer a good e-governance to their citizens. Sites are lagging behind in following the open standards. The features that impact on usage ratio are not well considered in the development of the sites. The sites themselves were built just to show their existence. The result indicates that sites are not popular and people directly visit the municipal offices for necessary services and information. Even though there are considerable numbers of internet users in Nepal as of 2011 statistics [18].

Municipalities are the local services provider, which deliver more than hundreds services directly to their citizen. Information Technology Policy of Nepal, 2000, also aims to build a knowledge-based society which means enabling use of ICT and effective online presence. The outcome indicates unreliability and untrustworthiness in the e-government systems of Nepal.

As suggested by Pokhrel and Park 2009, [19] all the municipalities websites are independent and have their own isolated and scattered database system. Thus there is high probability of data loss and data redundancy. Need of integration of all entities in common domain providing unified standard at different level is hence proved to be important in this case. Existing system does not impose the smart use of internet-based technology. Their smart uses are reflected in terms of the websites services in democratic participation, access to public data, efficiency in work process and quality [20].

With development focused mainly on capital city and e-readiness index of 0.2568 as of 2010, a Nepal government initiative to foster ICT throughout the country is a long road ahead.

There is a gap between plans and policies and their implementation. Websites presence of municipalities to materialize the e-government vision shows only a minimal juncture. Most of municipal websites provide information such as demography, history and culture, and little political information focused mostly on the composition of the municipal administration. Some of them have downloadable forms that could be only submitted offline. Technical aspect of websites design shows no expertise in fulfilling the minimum needs like being consistent, dynamic, ubiquitous, interactive, customizable, searchable, and networkable [7].

Contents promoting citizen's participation and awareness on local policy making process were negligible. Very few of them provide their contact information. Some of them provide discussion forum but none of them were effectively used. There is lack of appreciation of websites by municipal government. Clearly, prompt and reliable services, quality, transparency and bringing all groups in society together in governance process completely lack in their web presence. The strategy to implement e-governance master plan 2006 also required to address the post project carry out plan in order not only to show websites presence but also keep the things functional in the long run.

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IT enabled service innovation in e-government: the case of Taiwan drug abuse reduction service

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ABSTRACT

Drug abuse problem is one of the toughest issues faced by governments in the world. The typical solution is every time when the drug abuse offenders are under arrest, they are jailed for a while. There is high probability that they will repeat the offense after leaving the prison. Thus, such a solution wastes lots of administrative resources from the government, yet still cannot reduce the recidivism of drug abuse. Nowadays, most countries treat drug abuse offenders as patients, and offer them substitute treatment in order to reduce the dependence on drug and also reduce the risk of infecting AIDS. The patients will go to work as a normal person, live as a normal person, and keep their human dignity. In this study, we introduce the care of Taiwan drug abuse reduction service by service blueprinting method. The service integrates several ministries of Taiwan government in signal information system, and will be triggered automatically when the drug abuse offender is leaving the prison. Subsequently, we analyze the case by the framework of Service Open System View and then provide some suggestions for improvement of the existing service. This study share the case of Taiwan drug abuse reduction service and provide the best practice of improving existing service by the view point of service science to academics.

Keywords: IT enabled service, e-government, drug abuse reduction service.

INTRODUCTION

Drug abuse problem is always ranked as one of the toughest issues faced by a government in the world. It is very difficult to monitor drug abuse offenders after they are out of prison. It is also difficult to perform service of detoxification when they are not in prison. On the other hand, drug abuse offenders are not easy to find jobs, and can be easily attracted by drug abuse group. Therefore, there is high probability that they will repeat the offense after leaving the prison.

In the viewpoint of drug harm reduction service provider, the complicated service process is cross several ministries including Ministry of Justice, Police Agencies, Council of Labor Affairs, and Department of Health. The service is an

extremely difficult task. This predicament seems to have no correlation with information technology (IT) at first glance; however, after a carefully review on the problems, procedure and the regulations of drug abuse, IT can actually contribute a lot to the service of drug harm reduction.

The project "Single window service for drug abusers" (SWSDA) in Taiwan was established on December 2008. The tasks of creating SWSDA include building the information center of drug abuse offenders that collects all the valuable information from relative ministries (or agencies), as well as building the standard operation procedure (SOP) for Drug Abuse Prevention Center. The collected information and built SOP are very helpful for the counselor of Drug Abuse Prevention Center, who are responsible for supervising the offenders who are set free from prison to rejoin the society without the harm of drug. The project was launched by Drug Abuse Prevention Center in Taipei City, Taipei County, Taoyuan County, Tainan County and Taitung County on January 2009. Later on May 2009, the service was extended to the whole country.

The motivation of this study is to discuss the case of SWSDA from the lens of Service Open System View. The success of IT-enable service relies not only on IT but also the coordination of service co-creators. In addition, we try to identify the service gaps, and provide suggestions to fill these service gaps.

There are three major parts of this article. At first, we will briefly review drug harm reduction researches in the literatures, and also describe the substitution treatment of drug abuse. Second, we introduce the details about the project of SWSDA in Taiwan. Finally, we discuss the service gaps and their corresponding solutions

RELATIVE LITERATURES AND DRUG ABUSE TREATMENT SERVICES IN GOVERNMENTS

Substitute treatment offers drug abuse offenders Methadone or Buprenorphine to substitute their drugs. The properties of Methadone and Buprenorphine are lower addictive and long interval between taking drugs. The drug abuse offenders can reduce the use of drugs and resolve

drug abuse problems in their daily life. Furthermore, the substitute treatments is not liquid to inject into human body, it is pills to eat. The number of patients with infectious diseases transmitted by injection like AIDS, Hepatitis B, Hepatitis C and endocarditis will decrease.

A study with 506 drug abuse males in New York in 1988 showed 71 % of observed subjects did not inject drugs during the period of substitute treatment. Sixty percents of observed subjects did not injection drugs longer than one year. But there were 80 percents of observed subjects whose were not treated by substitute treatment abused drugs again within twelve months (Ball et al.).

Another study conducted by the U.S. National Institute of Drug Abuse in 1996 observed 2973 subjects, including substitute treatment experiment group and reference group, and within 15 states in the U.S. After 6 months of observation through urine testing, the study reported that the number of people who did not abuse drugs in the experiment group was 3 times of the number in the reference group (Metzger and Navaline, 2003).

Hong Kong Methadone Treatment Programme began in 1972, and put into practice in the entire Hong Kong area in 1976. The program is jointly in charge by Hong Kong Narcotics and Drug Administration Unit and The Society for the Aid and Rehabilitation of Drug Abusers. The goals of Hong Kong Methadone Treatment Programme are: (1) Provide easy, legal, and medically safe and effective drug; (2) Help drug abuse offenders have self-reliance and live a normal life; (3) Reduce the case of needle sharing through monitoring, health education, and counseling; (4) Encourage drug abusers to receive treatment; (5) Help drug abusers to detoxicate drug (treatment, rehabilitation, and reintegration). There are one assistant director-general, three full-time senior doctors, 26 social workers, 42 doctors, and 135 medical assistants who provide services in the night-time clinics. And there are 20 Methadone clinics open 365 days a year, 7:00 to 22:00. The lower the service waiting time, the less the cases of drug abuse. If a gap exists between the methadone maintenance treatment and the drug abuse demand, the drug abuse offenders may resort to drugs again.

This particular program has been successfully running for more than 30 years. The reason Hong Kong government uses the substitute treatment is to save the drug abuse offender's life first and work on abstinence and rehabilitation later.

In Taiwan, Ministry of Justice performed a two-stage investigation into drug abuse offenders in various types of criminal activities in 2008. The purposes of first-stage investigation are to recognize the need of Careline for the drug abuse offenders, how drug abuse offenders understand about Drug Abuse Prevention Center, and difficulties and needs in the processes that drug abuse offenders rejoin the society. The objective of second stage is to identify demand for job training and employment from drug abuse offenders. The second stage investigation include questions for determining correlation between calling time and content of requests for calling the Careline for drug abusers in order to effectively and economically allocate manpower resources and relative resources within Careline for drug abusers. The research findings bring valuable insights as follows: (1) In order to provide a helpful service by Careline for drug abusers, we have to integrate resources from related agencies such as Drug Abuse Prevention Centers, Department of Health, and Council of Labor Affairs. (2) Careline for drug abusers should provide services 24 hours a day for different types of drug abusers. (3) Integrate channels to provide help to drug abusers in order to increase the convenient for drug abusers. (4) Promote and advertise often the Drug Abuse Prevention Centers to the public. (5) Promote and advertise often the Drug Abuse Prevention Centers in the prison, and the frequency of individual counseling service for drug abusers. (6) Initiate programs of facilitating employment for drug abusers.

PROJECT CASE

Drug abuse problem in Taiwan

Drug offender is the highest number of population in various types of criminal in Taiwan. There are 38.5 percents (25,064 persons) of prisoners in correctional facilities including prisons and jails who are drug offenders. In addition, recidivism rate of drug offenders is 79.3%, and 72.9 percents of recidivist are addicted to heroin or morphine.

It is very difficult to fully rehabilitate the drug addiction. Repeat drug offenders once out of prison can hardly decrease the recidivism and waste a lot of social resources. Therefore, in practice the drug addicts should be treated as patient nowadays. Taiwan Narcotics Endangerment Prevention Act was adapted to this point of view on 1998 and treats first drug offenders as patients, and treats first repeat offenders as criminal.

Drugs harm prevention policy also gradually changed from the previous containment arrests to

directing drug offenders to substitution treatments. Substitution treatment given to drug addicts enables them to get rid of addiction to drugs, to work properly, to live a normal life, and to keep their personality. It further reduces the risk of being infected with AIDS from injections of heroin, and the social problems from misdemeanors caused by drug abuse.

Related agencies and IT-enabled services in Taiwan

The first department in Taiwan which promotes substitution treatment is Department of Health. Department of Health launched a drug addiction and AIDS Harm reduction program and assigned each local Health Center to adopt drug substitution therapy. The District Prosecutors Office of Taiwan Ministry of Justice gives relief for the prosecution of second drug offenders and forces those second drug offenders to be treated with drug substitution therapy in local Health Center. Every county and city governments in Taiwan had formed local Drug Abuse Prevention Center. Taiwan's government expects to help up to fifteen thousand drug offenders a year out of prison for detoxification by above programs, and to reduce impact on the community once the drug offenders are out of jail.

Prison database also transmit the assessment information on detox outcomes of those drug offenders during the period of imprisonment to the information center of drug abuse offenders (2) Department of Health collects real-time substitution treatment information of drug abusers from each local Health Center, and imports those information to the information center of drug abuse offenders daily. This allows the counseling staffs of the Drug Abuse Prevention Centers to know well the governance situation of substitution treatment reported by the counseling cases. (3) National Police Agency collects records about urine test for drug offenders from city and county police departments and reports about inspection visits by police officers concerning the security of drug offenders, and imports those data to the information center of drug abuse offenders. In order to monitor whether the drug abuse offenders are repeating the use of drugs and whether the drug abuse offenders are out of contact with local Police Office. (4) Council of Labor Affairs collects information about drug abuse offenders who participate in job training provided by city governments or county governments and information about drug abuse offenders who have got jobs, and then imports

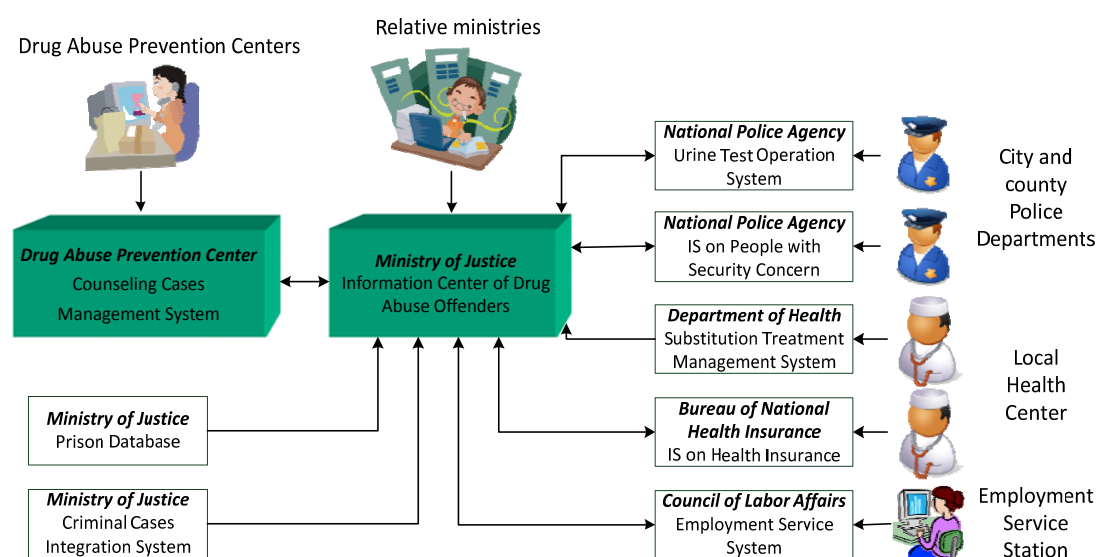


Figure 1: Related government agencies

In May 2009, the Department of Information Management in Ministry of Justice in Taiwan took over an IT-enable service for drug abuse reduction that was named "Single window service for drug abusers". The SOP of service is composed of following steps. (1) Criminal case database in the Ministry of Justice imports personal information on drug offenders who will be out of prison soon to the information center of

that information to the information center of drug abuse offenders daily. This allows the counseling staffs of each Drug Abuse Prevention Center to know well the employment status reported by the job training cases. (5) Each counseling staff of the Drug Abuse Prevention Centers has to not only accesses the information about drug abuse offenders but also update the detail information about daily counseling cases into the information center of drug abuse offenders. (6) Bureau of

National Health Insurance provides online connection to query the information about health insurance of each drug abuse offender that was insured by employer in order to monitor the latest employment status of drug abuse offenders. Figure 1 depicts the information flows of the related agencies.

Service gaps on SWSDA from the viewpoint of Open System View

Service organizations are sufficiently unique in their character to require special management approach. The distinctive characters enlarge the system view and include the customer as a participant in the service process. On the other hand, customer is viewed as an input that is transformed by the service process into an output with some degree of satisfaction. (Fitzsimmons, 2008)

In this session, we adapt Open System View which is by created by Fitzsimmons as a lens to analyze SWSDA in Taiwan, and to identify service gaps. As Figure 2 shows, there are 6 key components those are consumer demands, service process, evaluation, service personnel, service operation manager, and service package separately in the Open System View.

addictive and long interval between taking drugs. The drug abuse offenders can reduce the use of drug and avoid drug abuse problems in the daily life.

Service Process: Base on the consumer demands, the service provides substitution treatment, counseling service on detoxification, and job matching, etc.

Evaluation: The service evaluates the overall customer's satisfaction during the entire service process. The factors in customer's satisfaction include the convenience of patients treated, the number of successful detoxification cases, and the number of job matching cases.

Service Personnel: Service personnel concerns about the training of counselors who provide services to drug abusers, the training of counselors who evaluate whether the drug abusers are suitable for substitution treatment, and the training of health professionals, etc.

Service Operation Manager: The objectives of service operation manager are to meet customer demand through the interaction between customers and service staffs, to control service process, to monitor service quality measurements,

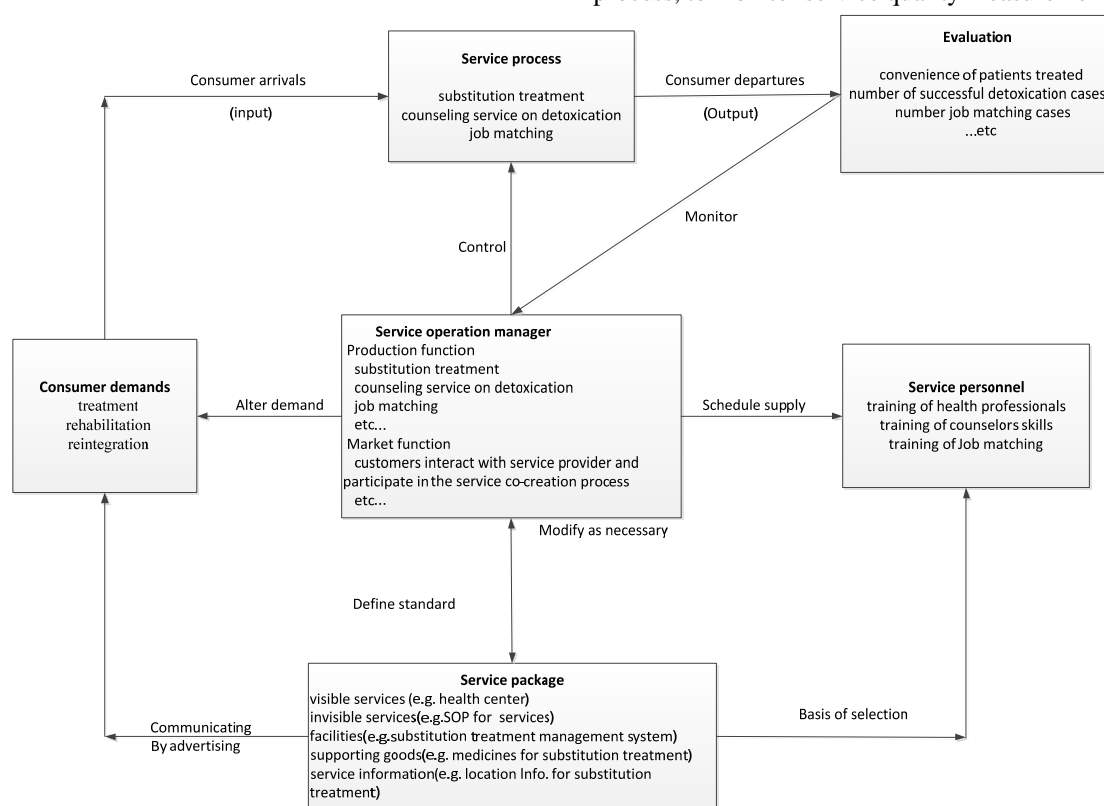


Figure 2: Open System View

Consumer Demands: Easy, legal, and medically safe and effective drugs, which are lower

schedule the training of service staffs, and define service standard. In details, "Production

function” treats all processes (including substitution treatment, counseling service on detoxification, and job matching etc.) as a service; Customers interact with service provider and participate in the service co-creation process is an important source of information in “Market function”.

Service Package: The characters of SWSDA are very special; it is humanitarian in nature and maintains law and order; it is a kind of social welfare and a kind of compulsory medical service. The relative laws and regulations using in the SWSDA have to be ready before the service is launched, because the service requires a lot of full-time manpowers who must have a legal status, and the compulsory medical services must have legal basis. The experience of interaction between drug abusers and service staffs should feedback to the law amending process, in order to fill the gaps between legislative knowledge and actual practice today.

DISCUSSION

After the analysis above, this study discovers that five gaps exist in the SWSDA. These gaps and the recommended solutions to fill the gaps are discussed below.

Service Personnel

Gap 1: There is no full-time employee devoting to counseling and to service for drug abusers in the Drug Abuse Prevention Centers.

The idea of Drug Abuse Prevention Center was generated in the first Drug Abuse Prevention Meeting which was held by Taiwan Executive Yuan in 1996. And then, Executive Yuan asked the district prosecutor offices of Taiwan Ministry of Justice to assist local county and city governments to establish Drug Abuse Prevention Centers. Drug Abuse Prevention Center is only a service concept and a part of daily operations of local government staffs. Therefore, there is no full-time employee in the Drug Abuse Prevention Centers. And, it is unable to really monitor all counseling cases of drug abusers.

Lack of manpower is the most critical problem of Drug Abuse Prevention Center. In short-term, we suggest that Taiwan government should use the second reserve funds in Executive Yuan for Drug Prevention Center to hire contract personnel who have counseling skills. In long-term, we suggest that change the Drug Abuse Prevention Center form a service program to a physical department through legislation so that Drug Abuse Prevention Center will have their own budget and their own staffs.

Service Operation Management

Gap 2: Counselors and medical personnel do not build relationship and trust with drug abuse offenders before they are out of prison. It is very difficult to monitor drug abuse offenders after they are out of prison. Thus, it is not easy to perform detoxification service afterwards.

Due to the lack of manpower in the Drug Abuse Prevention Centers, it is impossible for counseling staffs to conduct face-to-face and one-by-one counsel before the drug abuse offenders are out of prison. Accordingly, counseling staffs are also difficult to make the connection with drug abusers.

For this gap, we suggest that Drug Abuse Prevention Centers should increase the number of times to advertise in the prison, and the advertisement should put more emphasis on introducing functions and roles about the Drug Abuse Prevention Center, form a professional, familiar, and human-caring image in drug abuser’s mind, in order to let the counseling staffs be closer to the drug abusers.

Gap 3: There is no employment and residence mechanism for drug abuse offenders after they are out of prison. There are no related organizations to administrate those mechanisms.

It is difficult if not impossible for drug abuse offenders to take drug in the prison, but it is easy to take drugs again after they are out of prison. The primary reason is that a lot of drug abuse offenders are not accepted and helped by their family after out of prison. Therefore, the drug abusers do not have a stable place to live in, vulnerable to social exclusion, and easy to be attracted by the same type of people. Thus, drug abuse offenders have very high probability to take drugs again. On the other hand, the employments of after-inmates (people who are out of prison) are rare because employers are not willing to employ after-inmates. That is, drug abusers are not easy to make their ends meet, and live like a normal person.

Nowadays, the only one law (Narcotics Endangerment Prevention Act 25) in Taiwan related to after-inmates who are drug abuse offenders. These after-inmates must regularly test their urine within two years after released. We suggest that it should establish some halfway houses and the drug abuse offenders can spend their last half of sentence in halfway houses. This suggestion results in two great outcomes. The first is the drug abuse offenders can get jobs and back to the community under strict surveillance.

The second is the drug abuse offenders can try to stop taking drug in the community. The drug abuse offenders could find jobs by themselves or by a government agency. On the other hand, the drug abuse offenders have to test their urine regularly. If the drug abuse offenders take drugs again or do harm to society again, they will be back to prison.

Evaluation

Gap 4: Substitution treatment is not yet an universal and effective execution in Taiwan.

The effects of substitution treatment were testified by USA, Singapore and Hong Kong. Especially, the Hong Kong practices are more than 30 years, and have great successful outcomes. In contrast, there are only 20% of local health centers providing substitution treatments in Taiwan, and the drug abusers have no idea to get help from governments. The counselors should make more effort on promotion of substitution treatment and help the drug abusers to take substitution treatment.

First, we suggest government to integrate all the helping channels including prisons, Drug Abuse Prevention Centers, police departments, health centers, and employment services in order to provide more convenience services. Second, we suggest the government to build a 24-7 call center to play the role of service window for difference customer needs.

Service Package

Gap5: There is no service SOP (standard operation process) nor rules in the Drug Abuse Prevention Centers, and there is also lack of service measurements in the related organizations.

There is no standardized service process in the Drug Abuse Prevention Centers in difference cities and counties. We suggest that the government must design a uniform process in the Drug Abuse Prevention Centers. In addition, the performance measurements which do not well established for the goals of drugs harm prevention is a big problem too. For instance, one of the measurements of police in the field of drugs harm prevention is how many drug abuse offenders they arrested. We suggest the measurements should be changed from the number of arrest cases to the number of drug abuse counseling cases and further change the weight of measurement in counseling case. When the police are doing inspection visits concerning the security of drug offenders, they will introduce the drug abuse reduction service to the drug abuse offenders instead of arrest them again.

CONCLUSION

The SWSDA in Taiwan is working but not to its full potential. There are five service gaps exist in the current service. After discussing the service gaps in the SWSDA, we offer service improvements to fill the gaps. The ultimate goal is to make the drug abuse reduction and prevention effort effective through IT-enabled services that are easy to use, convenient to use, and useful for the drug abusers. With a clear goal to work for, the service will become more and more complete. Although the drug harm reduction work is very tough, but there are many successful cases to take lessons from. Even though there are only ten to twenty percent reductions in the recidivism rate of drug offenders, the SWSDA still has great potential to benefit the whole society in Taiwan.

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POVERTY LEVELS AND COUNTY E-GOVERNMENT SERVICES IN THE UNITED STATES

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ABSTRACT

The purpose of this study was to examine E-Government services for citizenry at the county level. The study involved data collection from a random sample of 346 counties in the United States. The collected data included county website presence, twelve E-Government factors, median household income and poverty percentage. The results indicated that less affluent counties were more likely to not have a web presence or offer fewer E-Government services than more affluent counties.

Key Words: E-Government, County Governments, Median Household Income, Poverty Percentage

LITERATURE REVIEW

The World Bank defines E-Government as “the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions [10].” The World Bank’s Web site goes on to define three types of E-Government interaction. The first type takes place when a government interacts with its citizenry. This is interaction is known as G2C or government to citizen. Examples of G2C are paying property taxes online or registering to vote online. The next interaction involves government and businesses. This is known as G2B or government to business. Examples of this type of interaction include application for permits online or fee payment online. The last interaction is G2G which is the interaction between government agencies. This interaction often involves information sharing such as a county that has the ability to access city law enforcement records. The E-Government Act of 2002 has served as a catalyst for the growth of E-Government in the United States [9].

Extant research on E-Government provides insights in how to measure governments’ progress in E-Government implementation. However, little empirical evidence exists as to the current status of E-Government services in the United States. Both Hiller and Belanger [4] and Layne and Lee [6]

presented models for measuring e-services implementation. Reddick [7] combined parts of the models and developed a survey which was completed by 4,123 chief administrative officers of United States city and county governments [7]. Reddick reported that, while many governments were offering some level of Internet-based interaction between the citizenry and the government, the level of interaction was extensive for only a few municipalities. Reddick established a list of “government to citizen” factors describing types of interaction being facilitated electronically by government entities. These factors are:

- a. Online payment of taxes
- b. Online payment of fines/fees
- c. Online completion and submission of permit applications
- d. Online completion and submission of business license applications/renewals
- e. Online requests for local government records
- f. Online delivery of local government’s records to the requestor
- g. Online requests for services, such as pothole repair
- h. Online voter registration
- i. Forms can be downloaded for manual completion
- j. Online communication with individual elected and appointed officials
- k. Online reservation of recreational facilities
- l. Online utility payments
- m. Online registration of property such as bicycles [7]

Baird et al. [1] modified this list to target county government activities specifically as opposed to city government services [1]. As such, items k, l, and m were omitted because they are services typically provided by city, and not county, governments. In addition, the Baird et al. study added two additional factors reflecting dissemination of information to the public via county websites:

- a. Provides general news and information to the public
- b. Provides economic development information to the public

The authors found that, as of January 2010, 75 percent of county governments sampled had a web presence, but that counties with no E-Government presence had a significantly higher poverty percentage and lower median income than those in which the governments had a web presence. Across all of the factors examined, counties not offering that service were statistically poorer than those that offered the services [1]. Because county governments often service rural areas, a

lack of E-Government offerings in those areas can be more disadvantageous than in urban areas because of a lack of public transportation. It can be argued that citizens in rural areas would benefit more from being able to interact with their local governments online because of the increased difficulty or longer distances to travel to the government offices. Those citizens who are more economically disadvantaged may have an even more difficult time obtaining services if they are not offered electronically. Therefore, offering fewer E-Government services in counties in which the poverty levels are higher can be a real hardship to those citizens. This is supported by Rey and Ozymy [8], who found that individuals with lower incomes and those who are considered minorities may be more likely to use and to benefit from E-Government services [8]. In addition, E-Government services may promote civic involvement [5]. Failure to provide those services in less affluent counties can further disenfranchise citizens of those counties.

In April 2009, the Federal Communications Commission initiated a conversation that was the genesis of a National Broadband Plan – a plan that strives to make broadband available to all parts of the United States [3]. Through the American Recovery and Reinvestment Act of 2009, over \$7 billion was allocated to expand broadband access to rural areas of the United States in an effort to reduce the “digital divide” in regard to Internet access [2]. With those efforts, combined with the E-Government Act of 2002, one might expect corresponding increases in E-Government offerings in county governments, since county governments serve rural areas, and Internet access should now be more available to citizens in those counties. However, widespread budget problems for state and local governments may have prevented those governments from expanding E-Government offerings. This study seeks to examine the progress made, if any, during 2010, in regard to provision of E-Government services in U.S. counties, particularly in less-affluent areas. For the current study, we employ the factor list and methodology used in the Baird et al. [1] study to examine the current status of E-Government services provided to citizens by county-level governments in the United States.

RESEARCH METHOD

All data for this study was collected between January 30 and 31, 2011 by 251 undergraduate students in a management course at a medium-sized midwestern university as part of a class project. Data about E-Government services was gathered directly from government websites. A sample of 346 out of 3,140 counties in the United States was randomly selected. Each student was randomly assigned 15 of the counties to analyze, with at least five students being assigned each county and no two students having the exact same counties. The professor set aside time in class to demonstrate the data collection process (i.e. how to find an appropriate web site, what items to search for within a site, etc.) After the students had collected their data, the

professor combined the results from all students into a spreadsheet and sorted by county. In situations in which an individual county’s information differed across students, the professor and a graduate student assistant visited the appropriate web sites in order to determine the correct information. In addition, the professor and graduate student verified the data collected for counties for which all student answers agreed. This verification and reconciliation process was performed on February 1, 2011 in order to minimize the chance that a website might change during the data gathering process. Students were assigned points for collecting the data. If the data collected by the student was not correct, his or her grade reflected the error.

In order to collect the data, each student was instructed to search the Internet for their assigned counties’ websites. If no website was found, a “0” was entered into an individual’s spreadsheet; if a website was found, a “1” was entered into an individual’s spreadsheet. For those counties for which a website was found, the students searched for each one of the 12 E-Government factors included in the study. Each factor was coded as a “1” if that type of e-service was being provided and coded as a “0” if the service was not being provided. For each county in the sample, median household income (MHI) and poverty percentage levels (PP) were obtained from the US Census Bureau (www.census.gov). A poverty percentage level provides a measure of the percentage of residents whose income is less than or equal to the poverty line amount. Thus, a high PP indicates that many residents are living at or below the poverty line. Based on the prior literature indicating that fewer E-Government services are offered in areas with higher poverty, the following hypotheses are tested:

Hypothesis 1a: The mean MHI of counties having a web presence will be higher than the mean MHI of counties not having a web presence.

Hypothesis 1b: The mean PP of counties having a web presence will be lower than the mean PP of counties not having a web presence.

Hypothesis 2a: The mean MHI of counties offering each of the 12 E-Government services will be higher than the mean MHI of counties not offering those services.

Hypothesis 2b: The mean PP of counties offering each of the 12 E-Government services will be lower than the mean PP of counties not offering those services.

Hypothesis 3a: The mean MHI of counties having a web presence and offering each of the 12 E-Government services will be higher than the mean MHI of counties with a web presence but not offering those services.

Hypothesis 3b: The mean PP of counties having a web presence and offering each of the 12 E-Government services will be lower than the mean PP of counties with a web presence but not offering those services.

RESULTS

As can be seen from Table 1, 71.4 percent of the counties sampled had a website. This percentage is slightly lower than that reported in the Baird et al. study [1] where 75 percent of the 344 counties sampled had a website. It should be noted that while this study and the Baird et al. study used the same measures, factors and methodology, the samples utilized were not the same.

The MHI for counties without a website was \$31,824 versus \$39,385 for counties with a website. When a t-test was

performed on the MHI data, the difference was found to be significant. Thus, Hypothesis 1a is supported. That is, Median Household Income does have an association with website presence. In Table 1, the results of the poverty percent t-test analysis can also be found. As expected, counties without a website had a higher mean PP than counties that had a website. Therefore, Hypothesis 1b is also supported because the difference was found to be significant at the .00 level. These findings are consistent with those reported by Baird et al. [1].

TABLE 1
STATISTICAL RESULTS FOR HYPOTHESIS 1

	Website	N	Mean	Std. Deviation	Std. Error Mean	t	2-tailed significance
Median Household Income	No	99	31,824	10721.86	1077.59	-5.476	.000
	Yes	247	39,385	11940.12	759.73		
Poverty Percent All Ages	No	99	16.0576	6.53548	.65684	5.876	.000
	Yes	247	11.6381	5.75777	.36636		

Table 2 provides information about the 12 E-Government factors discussed earlier in the paper. The three factors with the greatest occurrence among the counties sampled were: provide general news and information to the public, online requests for local government records, and online communication with individual elected and appointed officials. The three factors that occurred with least

frequency were: provides economic development information to the public, online completion and submission of business license applications/renewals, and online voter registration. In spite of all the efforts to increase E-Government offerings, Table 2 illustrates that the majority of counties are still not providing these services.

TABLE 2
NUMBER OF COUNTIES PROVIDING EACH TYPE OF E-GOVERNMENT SERVICE
Total sample (n = 346)

E-Government Factor	Counties with Factor	Counties without Factor
Online payment of taxes	105(30 %)	241 (70%)
Online payment of fines/fees	93 (27%)	253 (73%)
Online completion and submission of permit applications	93 (27%)	253 (73%)
Online completion and submission of business license applications/renewals	72 (21%)	274 (79%)
Online requests for local government records	121 (35%)	225 (65%)
Online delivery of local government's records to the requestor	96 (28%)	250 (72%)
Online requests for services, such as pothole repair	149 (43%)	197 (57%)
Online voter registration	81 (23%)	265 (77%)
Forms can be downloaded for manual completion	105 (30%)	241 (70%)
Online communication with individual elected and appointed officials	117 (34%)	229 (66%)
Provide general news and information to the public	167 (48%)	179 (52%)
Provides economic development information to the public	54 (16%)	292 (84%)

Table 3 show results of an analysis of MHI and PP for each factor for all 346 counties in the study. In order to test hypotheses 2a and 2b, a two tailed t-test was run on each factor for MHI and PP. As can be seen from Table 3,

significance can be found for every factor except for the last one, "Provides economic development information to the public." For each factor in the MHI analysis, the MHI is lower for the counties that do not have the factor. For each

factor in the PP analysis, the counties with the factor present have a lower PP than the counties without the factor present with the exception of the “Provides economic development information to the public” factor. With the exception of the

last factor, the findings in Table 3 were consistent with those of Baird et al. [1]. Thus, hypotheses 2a and 2b were supported with one factor exception.

TABLE 3
TESTS OF HYPOTHESIS 2A AND 2B
T-TESTS OF DIFFERENCES IN MHI BETWEEN COUNTIES WITH E-GOVERNANCE FACTORS AND COUNTIES WITHOUT

	Mean MHI		2-tailed Significance	Mean Poverty Percentage (PP)		2-tailed Significance
	Counties with Factor	Counties without Factor		Counties with Factor	Counties without Factor	
E-Government Factor						
Online payment of taxes	41,511	35,343	.000	10.6411	13.8880	.000
Online payment of fines/fees	13,816	11,041	.001	11.0122	13.5975	.000
Online completion and submission of permit applications	40,970	35,844	.000	11.2911	13.4950	.001
Online completion and submission of business license applications/renewals	41,908	35,990	.002	11.4126	13.2942	.024
Online requests for local government records	40,274	35,380	.001	11.6706	13.5652	.000
Online delivery of local government's records to the requestor	40,465	35,976	.002	11.0746	13.6046	.001
Online requests for services, such as pothole repair	41,309	34,130	.000	10.9459	14.3826	.000
Online voter registration	41,722	35,846	.000	10.4908	13.6398	.000
Forms can be downloaded for manual completion	41,647	35,298	.000	10.7652	13.8339	.000
Online communication with individual elected and appointed officials	41,105	35,238	.000	10.7967	13.9786	.000
Provide general news and information to the public	40,484	34,178	.000	11.3281	14.3716	.000
Provides economic development information to the public	39,319	36,834	.276	13.2736	12.8340	.639

Table 4 also reports results of an analysis of MHI and PP for each factor. The difference between Table 3 and Table 4 is that the latter only examines the 247 counties that have a website. For each factor in the MHI analysis, the MHI is lower for the counties that do not have the factor. For each factor in the PP analysis, the counties with the factor present have a lower PP than the counties without the factor present with the exception of the “Online requests for local government records” and “Provides economic development information to the public” factors. When the counties with no website are removed from the two tailed t-test analysis, only seven factors appear to be significant for MHI and five factors appear to be significant for PP. The findings for

MHI are not consistent with the Baird et al. [1] study in which all factors yielded a significant difference. However, the findings for PP are somewhat similar to those found by Baird et al. [1]. The earlier study found that six factors were significant. Four of the factors (online payment of taxes, online requests for services, online voter registration, and forms can be downloaded for manual completion) were significant in both studies. In the Baird et al. [1] study both “Online request for local government records” and “Online delivery of local government's records to the requestor” were found to be significant at the .05 level. Therefore, Hypotheses 3a and 3b are only partially supported.

TABLE 4
TESTS OF HYPOTHESIS 3A AND 3B
T-TESTS OF DIFFERENCES IN MHI AND PP BETWEEN COUNTIES WITH E-GOVERNANCE FACTORS AND
COUNTIES WITHOUT
(ONLY COUNTIES WITH A WEB PRESENCE)

	Mean MHI		2-tailed Significance	Mean PP		2-tailed Significance
	Counties with Factor	Counties without Factor		Counties with Factor	Counties without Factor	
E-Government Factor						
Online payment of taxes	41,511	37,813	.016	10.6411	12.3753	.019
Online payment of fines/fees	41,282	38,239	.070	11.0122	12.0161	.185
Online completion and submission of permit applications	40,970	38,428	.105	11.2911	11.8476	.463
Online completion and submission of business license applications/renewals	41,908	38,347	.061	11.4126	11.7309	.694
Online requests for local government records	40,274	38,531	.254	11.6706	11.6068	.931
Online delivery of local government's records to the requestor	40,465	38,698	.258	11.046	11.9963	.221
Online requests for services, such as pothole repair	41,309	36,460	.002	10.9459	12.6905	.028
Online voter registration	41,722	38,244	.031	10.4908	12.1979	.015
Forms can be downloaded for manual completion	41,637	37,720	.011	10.7652	12.2835	.034
Online communication with individual elected and appointed officials	41,105	37,837	.034	10.7967	12.2953	.029
Provide general news and information to the public	40,484	37,090	.036	11.3281	12.2852	.222
Provides economic development information to the public	41,524	38,921	.001	12.0039	11.5588	.756

CONCLUSION

The results of this study illustrate that many county governments in the United States still have no Web presence at all, and those that do often do not offer many E-Government services for their citizens. Additionally, there is still a disparity between E-Government offerings in more affluent communities and the offerings in poorer communities. The disparities in service offerings in counties with a Web presence were less pervasive than shown in the Baird et al. (2011) study. These differences could be due to changes occurring in the one year span between the two studies or could be due to the fact that the samples studied contained different counties. Both studies, however, show a clear disadvantage to less affluent citizens. Those citizens have fewer opportunities to engage with their county government officials, request services, and receive information electronically as compared to citizens in more affluent areas.

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PERFORMANCE MEASUREMENT OF GOVERNMENT E-PROCUREMENT WITH INTERNAL STAKEHOLDER FOCUS

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ABSTRACT

The previous literature of performance measurement of government e-procurement (or e-GP) is mainly focused on financial related performance measures and lacking of focus on overall internal stakeholders. Since objectives of public sector operation are not profitability, performance measurement of e-GP should include more extensive matters and not overlook the importance of internal stakeholders since they play important roles in success or failure in e-GP adoption and utilization. This paper aims to provide the overview of literature, the conceptual view of comprehensive e-GP performance measurement and how e-GP internal stakeholder should be addressed.

Keywords: performance measurement, e-GP, government electronic procurement, e-Procurement, internal stakeholder

INTRODUCTION

“Procurement” is the act of providing internal service by internal specialty working group, “procurement department” for internal parties/individuals. Term “procurement” and “purchasing” have been interchangeably used [32] in academic literature. However, term “procurement” has been in used more often due to the wider in scope than that of “purchasing” [48]. Since traditional paper-based procurement processes are complicated, time-consuming, and error-prone [11, 39], e-Procurement is the application of modern information technology developed for facilitating the better procurement processes. Therefore, term “procurement” and “e-procurement” will be used thoroughly in this paper.

The success of e-Procurement, rooted and experienced from private sector, originally as B2B application, has attracted public sector (government) to initiate own e-Commerce initiatives as part of e-Government modernization [10], in order to facilitate government e-Commerce affairs. Leipold et al. [31] and UNPAN [46] conceptualized e-Procurement for government (or electronic government procurement: e-GP) under the government’s e-Commerce dimension, as one of the four-dimension e-Government, in addition to

e-Service, e-Management, and e-Democracy dimensions. Government can be beneficial from the adoption of e-Procurement as both in-house and out-bound benefits.

The in-house benefits would be rather related to internal procurement processes, such as lower transaction costs [10, 13, 37], shorter procurement processing time [31, 39], effective and more standardized procurement procedures [31, 39], less paperwork and redundant administrative tasks [40], process transparency [2, 12, 31, 48]. The out-bound benefits are rather involved with external parties such as more G2B opportunities for small suppliers [2, 32, 39], greater choice in supplier selection [39], trust establishment to suppliers [13], greater strategic purchasing and negotiation power [10], increased competition among suppliers leading to the lower price [2, 31, 39]. However, the adoption of e-GP should not underestimate the potential internal barriers and obstacles those are possible caused internally. The potential internal barriers and obstacles can be at the beginning of the e-GP adoption as the initial resistance to change, pertaining to the case study of the government of Germany by Wirtz et al. [49].

Adopting e-GP is the bilateral perspectives which compose of the capabilities of institutions and individual willingness [22]. As research studies of e-Procurement adoption in general, internal barriers and obstacles can be caused by individual user level [4, 5, 17] and managerial level [13, 14, 18, 19]. For example, regarding users, the case study of the government of Denmark, indicates that the poor recognition of e-GP by decision makers can lead to the underutilization [21]. However, the situation as mentioned in these studies can be assumed to the adoption of e-GP as well. Also, the adoption of e-GP has been in slower pace [3, 32, 49]. This is due to the bureaucratic nature of government operational procedures and workflows [20, 39]. The slower pace implementation or underutilization of e-GP can lead to the below-expectation of the entire e-GP performance.

Performance measurement and performance management have been mentioned as aspects to be considered regarding the adoption and operation of e-GP [21, 30, 31, 42]. Moreover, performance measurement is the vital key in

deciding and designing courses of action to be taken in order to maintain or improve performance [6] since the outcome of performance measurement will be utilized in managing performance [37]. Hence, performance measurement of e-GP is not only essential, but also beneficial. Also, since procurement is an internally provided service, the performance measurement of e-GP should not overlook the internal stakeholders.

Internal stakeholders of each individual government yield different perspectives and expectations towards e-GP. The combination of diversified expectation from each group of internal stakeholder could lead to the comprehensive picture of the development of e-GP performance measures. For example, as the study of Raffa and Esposito [38] pertaining to the e-GP of the Italian public health care organizations, the capability of newly adopted technologies and all organizational actors' expectations must be well aligned. In response to the circumstance above, this paper aims to emphasize the importance of internal stakeholders towards the performance measurement of e-GP as how e-GP internal stakeholders should be addressed.

This paper is organized as the follows. Firstly, the previous studies of e-GP performance measurement are examined to determine the previous research direction in terms of the focus and the categorization of e-GP performance issues. The next section will be the discussion of the relationship of e-GP performance measurement and internal stakeholders. Finally, the last section is the conclusion and the future in-process academic work which is relating to this paper.

LITERATURE REVIEW

The number of research studies regarding government e-Procurement has been gaining momentum since the late 1990s [29]. The focuses of these studies are both buyer (government) and supplier sides. However, this paper will focus only on buyer side (government) only. The discussion of the previous literature in e-GP performance measurement studies will be detailed in the following sub sections.

Literature referred in this paper is classified as "micro" and "macro" level of focus based on the theme of the studies. Any studies which focus around the higher levels of government such as state or national level will be labeled as "macro" level of focus. Otherwise, any studies which focus around organization/agency's internal procurement processes, individual users, and

perhaps optional identifying of internal stakeholders will be considered as "micro" level.

Performance Measurement of e-GP

Regarding to the government e-Procurement research stream on buyer perspectives, Kassim and Hussin [29] defined the dimension of performance measurement /management under the "process management" stream. However, this research stream still receives little attention. In this paper, the e-GP performance measurement literature has included non-academic materials as recommended by Busi and Bititci [9] in that the knowledge sources should not be limited to only academic literatures. Therefore, we included extensive types of literature such as practitioner article [1], country paper [34], and government e-Procurement project report [23] beyond academic journal and conference articles. Some studies may not be titled as "performance measurement" but still be counted if the content included performance related terms such as "efficiency" and/or "effectiveness".

The focus of e-GP performance measurement literature is diversified in terms of involving stakeholders, performance measures and performance metrics. Term "efficiency" is the mostly used as both financial and non-financial related. Regarding the "effectiveness", most related performance measures are non-financial. This implies that most of e-GP performance measures had been mainly focusing on financial-related matter, as experienced from the private sector e-Procurement. The categorization of e-GP performance measures in previous literature is also diversified.

e-GP Performance Measures Categorization

Categorization of performance measures is differently defined by authors. Most "efficiency" mentioned in e-GP performance measurement studies are both financial related such as cost savings [12, 13, 21, 26, 35, 40], and price savings [12, 13, 21, 26]. Non-financial related "efficiency" as also been mentioned such as process time savings [35, 40]. However, Joia and Zamot [26] mentioned term "efficacy" as time savings and "accountability" as system accessibility and promptness. Lee et al. [30] mentioned about efficiency and transparency of e-GP of nine countries (Brunei, China, Fiji, Malaysia, Indonesia, Pakistan, Papua Neugine, Thailand, and Vietnam) in general with no identified e-GP performance measures in details. The other obvious performance measures categorizations are finance and non-finance [1], qualitative-quantitative [23, 31, 34], strategic-tactical-operational [28], technical and non-technical [7, 25, 41]. However, Settoon and

Wylid [42] and Singer et al. [43] directly specified the performance of e-GP as government saving at “macro” level. Also, interestingly, Vaidya et al. [47] categorized e-GP performance measures based on the modified five-perspective balanced scorecard (BSC) applied to the case of the Australian government’s e-GP. The categorization of e-GP performance measures of the previous literature is shown in Figure 1 and the summary of e-GP performance measurement literature as performance measures categorizations and level of focus is shown in Table 1.

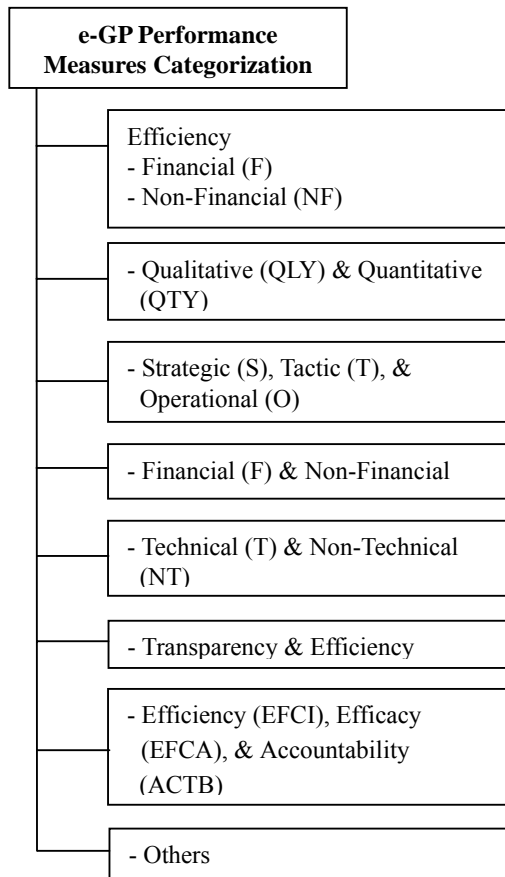


Figure 1 Categorization of e-GP Performance Measures

Table 1 Categorization of e-GP performance measures and level of focus

Categorization	Authors, Level of Focus, and Measures
Efficiency: as financial related (F) and non-financial related (NF)	Panayiotou et al. [35] (Micro) <ul style="list-style-type: none"> • Cost, budget accuracy (F) • Tender lead time, percentage of procurement with acceptable quality, productivity of resources (NF) Rosacker and Olson [40] (Micro) <ul style="list-style-type: none"> • Staff labor cost savings (F) • Process time saving (NF)
Efficiency (finance only)	Henriksen et al. [21] (Micro) <ul style="list-style-type: none"> • Costs savings (transaction and direct purchase) • HR and overhead savings Croom and Brandon-Jones [13] (Micro) <ul style="list-style-type: none"> • Process cost • Purchasing price Croom and Brandon-Jones [12] (Macro) <ul style="list-style-type: none"> • External price efficiencies Internal cost efficiencies
Efficiency (EFCI), Efficacy (EFCA), and Accountability (ACTB)	Joia and Zamot [26] (Micro) <ul style="list-style-type: none"> • Acquisition cost, price, # of intermediaries (EFCI) • Reduction of time (EFCA) • Information accessibility, Real-time traceability (ACTB)
Transparency and Efficiency	Lee et al. [30] (Macro) – detail of performance measures are not available
Finance (F) and non-finance (NF)	Aberdeen Group [1] (Macro) <ul style="list-style-type: none"> • Requisition cost, spending under management, % of maverick spending (F) • Requisition time (NF)
Quantitative (QT) and Qualitative (QL)	Hiyassat and Arabbyat [23] (Macro) <ul style="list-style-type: none"> • Cost (unit and transaction), Value for money (QT) • Service level quality (QL) Leipold et al. [31] (Macro) <ul style="list-style-type: none"> • # of e-transaction performed (QT) • Competitiveness, transparency, compliance (QL) Nordhus [34] (Macro) <ul style="list-style-type: none"> • % of transaction and % of procurement value performed electronically (QT) • Task allocation, competency, error reduction, financial control (QL)

Strategic (S), Tactical (T), and Operational (O)	Kassim and Hussin [28] (Micro) <ul style="list-style-type: none"> • Relationship development, transparency , cost (S) • Access to information sharing (T) • Process efficiency (O)
Technical (T) and Non-technical (NT)	Jang [25] (Micro) <ul style="list-style-type: none"> • Information and system quality (T) • Individual user performance (NT)
Technical only	Bruno et al. [7] (Micro) <ul style="list-style-type: none"> • Website effectiveness Rose et al. [41] (Micro) <ul style="list-style-type: none"> • Website design quality
Others	Vaidya et al. [47] (Micro) <ul style="list-style-type: none"> • Efficient purchasing • Value for money • Processing cost • Strategic information availability • Greater accessibility Settoon and Wyld [42] (Macro) <ul style="list-style-type: none"> • Direct savings to government Singer et al. [43] (Macro) <ul style="list-style-type: none"> • Administrative savings • Price differentials

In conclusion, the research studies of e-GP performance measurement still receive little attention among scholars. Most performance measures used in the existing literature are financial related due to the more appealing than the qualitative non-financial performance measures [15] since the main objective of e-Procurement adoption is cost reduction [45]. The existing literature of e-GP performance measurement are also scattered in term of the performance measures design and categorization, approach and framework used, lacking of definite focus on and mapping of the overall internal stakeholders to the designated performance measures.

E-GP PERFORMANCE AND INTERNAL STAKEHOLDERS

Public sector is generally considered as non-profit and goals are not solely focused on profitability. In the same token, Martinsons et al. [33] stated that the conventional financial related measures are not the best suited to modern information system, as is e-GP. Therefore, the performance measurement of e-GP should be more comprehensive than traditional financial performance measures. Also, internal people (as internal stakeholders) are considered as one of

the vital elements and should not be disregarded [44].

Since procurement is dealing with the identification of and satisfying internal customer's needs in terms of goods and services [11], intra-organization people are the primary internal stakeholders who are not only in concerned for the success or failure of e-GP implementation [13] but also one of main elements of internal service performance via e-procurement. Moreover, internal stakeholders are not only play important roles in productivity enhancement but also could cause barriers and obstacles leading to the failure [24]. The case study of the government of Germany by Wirtz et al. [49] discovered that individual users can cause the "individual internal barriers" in e-GP implementation. Similarly, the study of MacManus [32], in the context of U.S. state and local government, mentioned that the e-GP adoption pace could affect the success/failure as well. This implies that the well planned change management is mandatory in order to promote the familiarity and acceptability among e-GP internal stakeholders which can lead to the satisfaction and the maximization of e-GP benefits and performance. Therefore, with the reasons stated above, e-GP performance measurement research study with focusing on internal stakeholder is essential and beneficial to the government in long term.

Regarding the e-GP performance measurement literature, internal stakeholders are categorized into two main groups as management [13, 28] and users [25, 28, 40, 41, 47]. However, the study of Aberdeen Group [1], Croom and Brandon-Jones [12], Henriksen et al. [21], Hiyassat and Arabbyat [23], Joia and Zamot [26], Lee et al. [30], Leipold et al. [31], Nordhus [34], Panayiotou et al. [35], Settoon and Wyld [42], and Singer et al. [43] are in general and mentioned no specific internal stakeholders. Table 2 provides the focus of internal stakeholders, and performance measures mapping of previous e-GP performance measurement literature.

Table 2 The focus of e-GP internal stakeholders and mapping of e-GP performance measures

Authors	Internal Stakeholder in Focus	Mapping of Measures to Internal Stakeholders
Aberdeen Group [1], Croom and Brandon-Jones [12], Henriksen et al. [21], Hiyassat and Arabbyat [23], Joia and Zamot [26], Lee et al. [30], Leipold et al. [31], Nordhus [34], Panayiotou et al. [35], Settoon and Wyld [42], Singer et al. [43]	None	X
Rosacker and Olson [40]	Users (Staffs)	√
Croom and Brandon-Jones [13]	Management	X
Kassim and Hussin [28]	Management and Users	X
Vaidya et al. [47]	Employee	X
Jang [25], Rose et al. [41]	Individual Users	√
Bruno et al. [7]	Users	√

Normally, management is concerned in cost, price, and saving issues. Then, any literature mentioned costs, savings, and prices would be considered as “management” concerned. In addition, any studies mentioning the costs, savings, and prices at the “macro” level can be considered as “management” concerned as well since the higher level of government is the collectivity of individual government agencies, as the instance of Settoon and Wyld [42] in the context of Malaysian and Indonesian governments. In conclusion, both management and users play important roles toward the success/failure of e-GP in different aspects.

Internal Stakeholders and e-GP adoption

Each group of internal stakeholders yields different interesting and expectation toward e-GP. For instance, management of government

agencies usually concern regarding financial related benefits while the lower level users may concern on different non-financial related issues such as user satisfaction and individual performance [25, 41]. Forman et al. [16] mentioned the expectation of users in different levels as “near-term” or “immediate gratification” for lower level users and “long-term” for higher level users, which can be assumed to the internal stakeholders of e-GP.

Regarding the internal stakeholder groups, Hardy and Williams [19] mentioned regarding the multiple-department involvement of e-procurement in public sector. This implies that there are possible to be more than management and users as the involving e-GP internal stakeholders. For example, the e-procurement’s supportive stakeholders, such as finance department, system administrator, or technical related parties, can be included even though they not directly involve with e-GP. The e-GP adoption model can indicate the profile and characteristics of technical related internal stakeholders. The public-private adoption model, in which the investment of e-GP system is jointed between the government and private company, require less technical related internal stakeholders than the proprietary system. Currently, many governments have adopted e-GP with public-private model such as the Danish’s Public e-Procurement Portal or PePP (www.gatetrade.net), the Malaysian’s e-Perolehan (www.eperolehan.gov.my), and the Italian’s Consip SPA (www.consip.it).

Conclusively, the previous literature of e-GP performance measurement is lacking of definite focus on overall internal stakeholder. As mentioned by Parker [36], all performance measures should be assigned a clear ownership of involving stakeholders, but in fact, clear mapping of internal stakeholders to designated e-GP performance measures are not clearly presented in e-GP performance measurement literatures.

Implication for Research

In public sector, as stated previously, goals of public sector are not solely the matter of cost and profit. Therefore, the adoption of e-GP with pure private sector model is not recommended [3, 28]. The direction of the e-GP performance measurement research is mainly focused on financial related measures under different terms. However, the focus on overall internal stakeholders and the mapping of stakeholders and designated e-GP performance measures are not obviously existed. This paper suggests that the research of e-GP performance measurement needs to focus more on overall internal

stakeholders as the reason stated previously. The comprehensive e-GP performance matrix with the focusing on internal stakeholders is desirable as research outcome.

In order to do so, the internal stakeholder must be clearly identified at the beginning. The government procurement processes need to be thoroughly examined and deeply understood to preliminarily determine the tentative actual groups of involving internal stakeholders. In this case, e-GP experts play important roles thorough the research.

The potential e-GP performance measures should be collected from the expert of each of the pre-identified group of e-GP internal stakeholders. The in-depth interviewing, as a form of semi-structured interview [8] allows the flexible way to elicit rich information and widely used in several e-Procurement research studies such as Croom and Johnston [11], Croom and Brandon-Jones [12], Croom and Brandon-Jones [13], Hardy and Williams [19], and Raffa and Esposito [38].

Regarding the performance measurement tools, since the balanced set of performance measures have been mentioned from several performance measurement studies, the balanced performance measurement frameworks should be considered and adapted, especially the framework with extensive consideration on the overall stakeholders.

CONCLUSION

Government e-Procurement or e-GP has been defined as a part of e-Government reformation as resulted from the new public management (NPM) paradigm. Since the adoption of e-GP is different from the e-Procurement in private sector in terms of goals and adoption model, the performance measurement of e-GP should not focus solely on financial related measures. Furthermore, e-Procurement is developed to facilitate the internal procurement processes, therefore, the overall internal stakeholders should be in consideration when measuring the performance of e-GP.

The literature of e-GP performance measurement is still fragmented in term of the categorization of e-GP performance measures and internal stakeholder in focus. This paper provides the overview of the past direction of e-GP performance measurement literature and the importance of overall e-GP internal stakeholders. Therefore, the focus of overall internal stakeholders is desirable in order to develop the comprehensive e-GP performance matrix.

Finally, as the consequences of this paper, the research work in performance measurement of government e-Procurement, which aims to develop comprehensive e-GP performance matrix is being on-process. Therefore, the research outcome can be beneficial to e-GP practitioners in performance management/improvement.

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Assessing the Global e-Readiness of Hotel Chain Websites

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ABSTRACT

Companies serving a truly global customer base need to adapt their websites to take the linguistic, culture and social differences of local markets into account. This study benchmarks the efforts of hotel chains to incorporate appropriately adapted content and facilities on their consumer websites as an indicator of their commitment to servicing international markets. Both individual findings and the summary Global e-Readiness Index suggest that most are not acting global in their e-commerce efforts. While many provide content in languages other than English, even the highest performers fail to take their internationalization efforts deep enough into the purchase process to facilitate purchases by international clients.

Keywords: e-Commerce, Globalization, Hotel sector

INTRODUCTION

Although lacking an agreed definition, e-commerce has become a key characteristic of modern society (Good & Schultz, 2002). Many businesses use e-commerce, in particular the medium of the Internet, to inform, interact with, and sell to customers all over the world [33]. As countless researchers have pointed out, the growth of the Internet as an information and commercial medium allows any company, regardless of its size or location, to reach out and transact with customers globally [8]. However, with many e-commerce efforts originating in the United States [35], a question mark arises over how well companies are prepared to cater to the global nature of e-commerce [18]. While in the past the majority of Internet users (and thus potential shoppers) resided in North America, web demographics are quickly changing, with Asian, African and Arab countries growing rapidly in terms of both Internet penetration and e-commerce revenues [13].

In relation to their e-commerce efforts, Bin et al claimed that "most American companies are so focused on their domestic market that they do not pay any attention to overseas" [6]. Quoting statistics from both IDC and from Forrester Research, they show that more than half of websites surveyed were doing little to internationalize their content; that many leading websites were turning away orders originating from outside the US; and that three-quarters of websites were not designed to handle non-US addresses or calculate non-US shipping costs [6]. While this may have been acceptable when the majority of e-commerce was being conducted within the USA, more recent statistics indicate that over sixty percent of e-commerce transactions now have at least one international (i.e. non-U.S.) party [33]). Being able to exploit this opportunity is highly dependent on having adapted to the needs of international markets [25].

Given the importance of selling in foreign countries for the travel sector, this paper sets out to explore if the major hotel chains are prepared to service clients from international markets on their consumer websites. Having examined the literature, the websites of the largest fifty companies are critically evaluated as to their suitability for use by non-US based consumers. Their Global e-Readiness Index (GRI) – a quantitative metric developed to assess a website preparedness to interact with a global audience is subsequently calculated [2]. Recommendations as to how websites could be improved are subsequently presented.

BACKGROUND

In an era where the world is essentially flat, firms operate in a global environment [15]. This is especially true of companies in the travel industry, as their customers typically come from all over the world. Thus the growth of the Web as a communications and commercial medium with worldwide reach would seem to offer great potential. By drastically reducing the importance of proximity, e-commerce helps companies to connect with people across borders with ease [32]. However, having the entire world as potential customers does not necessarily translate into being able to do business effectively on a global basis [3]. The challenges of operating globally are not trivial, given "the existence of around two hundred and thirty countries, over six thousand languages, one hundred and forty seven currencies and innumerable cultures and sub-cultures" [5, p 33].

Both the International Business and the International Marketing literature debate the merits of standardization versus adaptation strategies when addressing global markets [10]. Although standardization provides advantages in terms of lower costs, research has shown that in the electronic arena websites that use a standardized approach tend to be less able to compete with ones that use a local or regional strategy [31]. From the consumer perspective, multiple studies have also shown that country of origin affects both visitors' usage and their perceptions of web sites (see, for example, [9]; [21]; [36] or [27]). Most researchers agree that having a global audience "necessitates country-specific cultural adaptation" [39]. Therefore companies, particularly those in the service sector, that wish to be global players must adapt and tailor their web presence to the specific needs of clientele in each market.

To achieve this, the e-commerce literature suggests a number of inter-related issues that must be addressed. The most obvious is language [24]. While in the past the majority of Internet users resided in the US and for the most part spoke English [7], Anglophones now account for less than one-third of Internet users. Although English is the official language of nearly eighty countries, it is the native language of only seven

[30]. In addition, the number of non-Anglophones Internet users is growing rapidly. Despite this, the majority of Web pages remain in English [24].

Research has shown that a key element for e-commerce success is addressing markets in their native language [24]. For example, Forrester Research (2003) maintain that consumers spend nearly twice as much time, and are three times more likely to buy, on websites presented in their own language. Similarly, having surveyed Chinese, American, Egyptian and German consumers from an epistemological perspective, Seidenspinner & Thuner [33] maintain that translation of an entire website into the local language is highly advisable if a company wants to effectively address a particular market. Blended approaches - with part of the content presented in the native language and part in English - represent a reasonable, but less effective, compromise [33].

However linguistic translation is a relatively minor issue - adapting a website to meet the challenges of a global marketplace is more complicated. In particular the culture of local markets has a massive effect [9]. Culture can be defined as a shared set of values that influence societal perceptions, attitudes, preferences and responses [32]. Dutch cultural anthropologist Geert Hofstede [17] identified five dimensions of culture (power distance; collectivism vs. individualism; femininity vs. masculinity; uncertainty avoidance; and long- vs short-term orientation) which have subsequently been used by other authors to investigate the effect of cultural differences on e-commerce (see, for example, [28], [25] or [9]). While web content can be linguistically translated relatively easily, adapting to these issues is more difficult.

Several studies have specifically investigated the relationship between cultural factors and e-commerce variables such as website design, online shopping behavior and trust in an e-commerce context. Most highlight how significant attitudinal differences exist as regards online shopping between different regions of the world [34] - especially between western consumers and others [13]. For example, Seidenspinner & Thuner [33] maintain that users' cultural preferences impact their preferred navigation tools, perceived quality of page design as well as how consumers perceive and process information provided online. Similarly, Del Galdo and Nielsen [11] demonstrated how screen design directions have different psychological and social associations in different cultures, causing users to have different shopping experiences. Dong & Salvendy [12] continue this theme by demonstrating how vertically web menus for Chinese v.s. horizontally menus for US consumers increase performance and satisfaction due to the differences in the writing styles - i.e. top-down vs. left-to-right - in the two regions.

On a macro level, Kim & Lee [22] showed how different components of WebQual (particularly integrated communications, trust and innovativeness) affect the satisfaction and purchase intent of online shoppers in the US and Korea in different ways. In a similar study, Hwang, Jung & Salvendy [19] found that Korean consumers are more concerned about trust and security than consumers in either

the US or Turkey. Chau et al [9] found that US consumers preferred websites to directly provide information about their products, in contrast to the more social network approach preferred by respondents from Hong Kong. In contrast to direct sales pitches, the latter prefer information provided through user testimonials, chat rooms and user reviews, perhaps reflecting their relatively high collectivism score on Hofstede's aforementioned typology.

Adapting to such cultural differences is important for e-commerce success [29]. Singh & Pereira [40] maintain that consumers prefer to shop on and interact with sites that are specially designed for their locale, while in a follow up study Singh, et al [38] found that "culturally adapted web content positively affects user attitudes, site navigation and purchase intention". Luna, Peracchio and de Juan [23] claim that adapting web content to a market's specific needs enhances usability, reach and website interactivity, ultimately leading to higher purchase intent. Thus linguistic translation is only the first step to internationalization [8]. To be effective, a more thorough process of localization, taking into account the political, social, technical and economic conditions of each market, is needed to reconcile global strategies with local cultural and market differences [19].

In practical terms such adaptation can be difficult, requiring an in-depth understanding of the culture, values and norms of each target market [30]. If, for example, the issue of color is considered, white stands for purity in the West, but in India, Japan and several other Asian nations it represents death [26]. Similarly the number four is considered bad luck in numerology obsessed China, while thirteen, usually considered unlucky in Western cultures, is regarded favorably. Even within language groups, different approaches may be necessary. Hispanic consumers within the US differ both the general (English speaking) population, but also differ significantly from other Spanish language speakers in Central / South America or mainland Spain [37]. Even though linguistically they use (more or less) the same language, these important consumer groups cannot be lumped together, as each demands culturally relevant content adapted to their specific needs.

More practical challenges of localization become apparent when issues such as payment are considered. For example, US websites typically require payment by credit card. However in other regions of the world both credit card penetration and credit card usage are more limited. For example, in China the most common payment method is cash-on-delivery, reflecting the Chinese culture of cash-based payment [6]. Similarly in the Arab world the widespread use of credit and debit card is not readily accepted by the general population for historical and religious reasons [13]. In Germany payment by bank transfer is common, while in Japan consumers typically pay for online purchases at their local grocery store. To operate successfully in such markets, companies must adapt to local conditions, allowing customers to pay using whatever methods are the local norm, as failure to do so means significantly lower online sales.

Logistics and shipping can also be a challenge in international markets. Unlike in the US where delivery is typically contracted out to relatively efficient private firms such as UPS and FedEx, in many countries the only viable delivery service is the state-owned postal system, which is often notorious for being slow, unreliable and for mishandling goods [6]. To operate successfully in such markets, companies often have to develop their own solutions. In China, for example, as labor is relatively cheap, many large e-commerce companies have implemented a hybrid business model, with orders being processed online, but delivery being made by company employees who collect cash upon delivery. Flexibility and adaptation to local norms are thus keys to success.

The Global e-Readiness Index

As adaptation to the needs of different markets is clearly seen as a key success factor in the global e-commerce market, the concept of a Global e-Readiness Index (GRI) has been proposed to evaluate the preparation of company websites to interact with a global audience [3]. In their initial 2004 paper, Augustine and Surynt adapted a macro level concept that had previously been applied to measuring the potential of countries to support e-businesses (see for example [30]). Adjusting this idea for application at the company level, the authors synthesizing prior research to develop the Global Readiness Index (GRI) - a summary statistic designed to show the extent to which individual websites are ready to meet the requirements of operating in a global marketplace.

In their most recent study, the authors have refined their initial model so that the GRI effectively combines five elements: (1) Language – does the website offer languages other than its native language?; (2) Currency – does the website offer currency conversions or the ability to purchase in alternative currencies?; (3) Address – does the website accommodate non-US elements in the purchase address?; (4) Payment – does the website allow for payment options other than credit cards?; and (5) Logistics / Shipping – does the website support the use of shipping / logistics systems appropriate to multiple locales [4]. This portfolio of issues is largely supported by other independent studies. For example, Bin, Chen & Qin Sun [6] maintain that payment, logistic systems and language are the primary factors that every firm should take into account in the process of online globalization. Similarly Fields [14] highlights language, currency and payment options as key issues for hotels wishing to address an international audience, while Lituchy and Barra [23] suggest that websites need to localize in terms of language, address data, number format, date format and postal code in order to be able to work effectively with international audiences.

Calculation of the index score itself is carried out by performing a visual evaluation of the selected websites and assigning values based on how well each satisfies criteria developed using the variables described above, with a score ranging from zero to two (corresponding to low, medium and high) awarded based on the degree to which the specific measure is applied. The GRI is then calculated by simple summation and expressed as a percentage.

RESEARCH METHODOLOGY

Given the importance of international customers for most hotel companies [20], and the continued growth in the sale of hotel rooms over the Internet, it was decided to extend Augustine, Surynt & Jen's study to the hotel sector by assess the global e-readiness of the major international hotel chains.

Although the initial intent was to closely follow the same methodology, certain characteristics of the hotel sector necessitated various adjustments, which are summarized in Table One. In particular the fact that hotel rooms are an intangible product, and thus do not require delivery, made the logistics / shipping element irrelevant. In addition, as the literature stressed the importance of localizing not just from a linguistic point of view but also to take cultural preferences into account, a variable was added to incorporate localization. Whether a full or blended approach (i.e. whether the entire website or just a proportion had been adapted linguistically and culturally) was also thought to be important, and thus a variable was added to capture this data. Lastly, given the importance of the reservations process in hotel e-commerce, an in-depth assessment was carried out of each site's booking engine to establish if it too had been translated and localized.

Table 1. Adaptation of GRI Criteria for use in the hotel sector

Issue	Prior study	Current Study
Language	Yes	Yes
Localisation	No	Yes
Full Content	No	Yes
Bookings Engine	No	Yes
Currency	Yes	Yes
Address elements	Yes	Yes
Payment options	Yes	Yes
Logistics / Shipping	Yes	No

The population for the study was defined as the consumer websites of the top fifty global hotel chains as identified in Hotels Magazine ranking of January 2008. Actual assessment as carried out by three trained researchers during June 2008. Each researcher assessed each of the selected sites independently, scoring each variable using pre-established criteria. Their assessments were subsequently combined and differences highlighted. These elements were then re-examined collectively by the assessors and consensus achieved as to the most appropriate score.

In each case, assessment began with the brand's .com website. Initially the home page was reviewed to establish links to either country specific or international versions of the site to determine the number of languages available. Following the procedure outlined by Raisinghani & Beldona [30], alternative versions (specifically a French and / or Chinese version if they existed) were explored by comparing the pages generated by clicking on the top level menu systems to establish if alternative versions of the site were full content (i.e. they contained broadly the same content sections, features and facilities as the English version) and to see if the

non-English content had been localized (by the inclusion of distinctive looks or colors, special offers, images, local personas or text specifically targeted to the local market).

The booking engine (where present) was assessed in detail. Initially it was explored to establish if its pages were available in the alternative languages. The format in which the date needed to be entered (dd-mm-yy vs. mm-dd-yy) was also noted. A trial reservation was then made to examine the rate descriptions displayed by the system. Unlike the bookings engine's web pages themselves, these do not generally form part of the website code but are instead pulled dynamically from the chain's Central Reservation System. Thus, in some cases, while the user interface is displayed in the alternative language, the rate description (including important details such as booking conditions and cancellation restrictions) often reverts back to English.

Whether the rates displayed could be automatically translated by the system into alternative currencies was also assessed. Two different possibilities were noted here – the option to have the rates displayed into the currency of the user's choice, or the provision of a link to a currency converter to allow the user to perform such conversions for themselves on an ad-hoc basis on a third party website. The range of payment methods allowed was also noted. As was discussed previously, although credit cards are common in most countries, certain regions have traditionally preferred alternative forms of payment. For example, German / Swiss clients often prefer to pay by bank transfer, while charge cards such as Switch are widely used as a payment method in the U.K.

Lastly the address data that needed to be entered to complete the reservation was tested to establish if a zip / postal code was mandatory. Such codes are not ubiquitous, and requiring their entry can prevent international clients from completing a reservation. In some cases, validity checks are used on zip codes to insure that they match the address data, in effect making the entry of a false code (such as 00000) to complete the reservation process impossible.

For each variable, the presence / absence of the respective features was noted on the websites under assessment. The resulting data was then analyzed using SPSS to generate descriptive and non-parametric statistics, the results of which are presented below. As in the Augustine, Surynt & Jen study [4], each site's GRI was calculated by a simple summation of the individual variable scores, although as will be discussed later a more complex calculating, taking into account the relative importance of each variable, would be more appropriate.

FINDINGS

Given their importance for interacting with international clients, it's not surprising that hotel websites are multilingual in nature. On average, websites were available in five different languages (Mean = 5.14, standard deviation = 3.70). However the findings are positively skewed, with the majority of sites offering a lower number of options, and only a small number of sites offer a very high number of options. In

addition, nearly one quarter of hotel chain websites (24%) provided information only in English.

Where sites were available in alternative languages, over half (56%) were full content, with another twenty percent using a blended approach, provide some content in the additional language(s), but either omitting pages and / or linking back to English for some features. In the vast majority of cases (90%), the non-English language content had been localized with the inclusion of offers, features and other material specifically targeted to the market. Where the site was offered in a language other than English, in most cases (79%) the user interface of the bookings engine had also been translated into the alternative language. However, as the user dug deeper into the reservation process, the degree of adaptation to international markets fell significantly. Only 60% provided full rate descriptions in alternative language(s), with the remainder reverting to English for this key data. During the reservation process, over one third (34%) of sites required that dates be entered in US format, and nearly two-thirds (60%) required the entry of a zip / postal code in order to complete the reservation process. Payment options were similarly limited, with nearly three-quarters of sites only accepting the basic options of Visa / MasterCard or American Express.

Table 2. Cluster Analysis

Cluster	Overall	Cluster One	Cluster Two	Cluster Three
Sizes	50	6	15	29
Means				
Languages	2.0	3.0	2.8	1.3
Localization	0.7	0.8	1.0	0.5
Full Content	1.3	1.4	1.7	1.1
Bookings Engine	0.6	0.0	0.9	0.5
Date format	0.3	0.0	0.1	0.5
Rate Description	0.4	0.0	0.5	0.5
Currency	1.1	1.2	1.1	1.1
Zip	0.4	0.0	0.0	0.7
Payment	1.3	1.4	1.5	1.2
Variances				
Languages	1.6	0.0	0.3	1.7
Localization	0.2	0.2	0.0	0.3
Full Content	0.7	0.3	0.2	0.9
Bookings Engine	0.2	0.0	0.1	0.3
Date format	0.2	0.0	0.1	0.3
Rate Description	0.3	0.0	0.3	0.3
Currency	0.8	0.2	0.7	1.0
Zip	0.2	0.0	0.0	0.2
Payment	0.4	0.8	0.4	0.4

A cluster analysis was carried out to identify similarities among the companies studied. As can be seen from Table Two, three distinct clusters emerged. The first, dubbed *Partials*, contained six observations and was composed of companies that provided multiple languages on their website, in general provided fully localized content on these pages, but whose booking engine was only available in English. Rate descriptions were thus only offered in English, and currency conversion facilities (where provided) were external links rather than integrated into the site. Zip codes were required from those making reservations, and payment methods were limited. The second cluster, dubbed *Globals*, contained 15 observations and was composed of companies with multi-lingual, full content localized websites. However, in contrast to the *Partials*, these companies also provided their bookings engine in multiple languages, down to the rate description level. The largest cluster, dubbed *Locals*, contained 29 observations and was composed of companies that offered their website in a more limited number of languages, provided limited content in other languages and made little attempt to localized their offering. Such companies were in general less well adapted to international markets, requiring, for example that zip codes be entered and accepting few alternative payment methods.

As in prior studies, the above variables were combined to generate a Global e-Readiness Index (GRI). For hotel chain websites as a whole, the index figure was 55%, indicating that collectively these sites are not well adapted to cater to international clientele. However averages can be deceptive, as in fact the GRI scores ranged from 13% to 80%, with a standard deviation of 22%, indicating wide dispersion. As can be seen from Figure One, the data is negatively skewed (-0.68), indicating that while many sites had high scores, a tail of lower performing companies negatively affected the average.

Post-hoc analysis of the results revealed that many of the sites with lower scores were US focused hotel chains, and that their performance was having a negative effect on overall findings. To test if this difference was statistically significant, the data were split into two groups – that of US hotel chains (defined as those having their corporate headquarters within the US) and international chains (those with their headquarters in other countries).

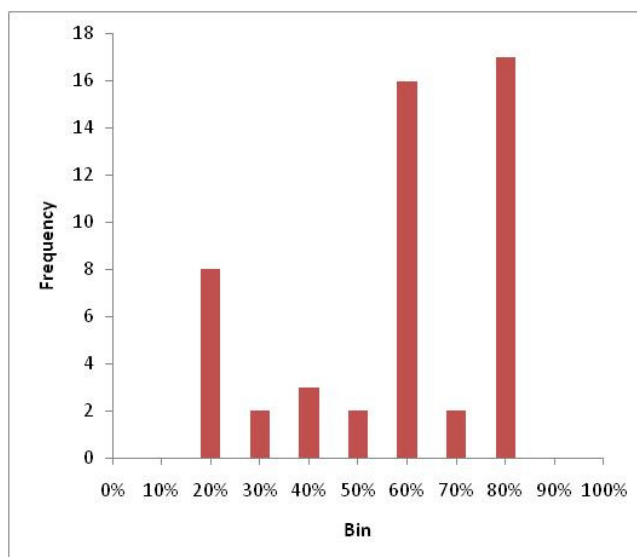


Figure 1. Frequency Distribution of the Global e-Readiness Index Amongst International Hotel Chains

As can be seen from Table Three, the GRI for these two grouping differs greatly, with the difference being significant at the 99% confidence level. Similarly it was postulated that economy hotels tended to have a lower GRI than other types of hotels, as such chains generally tend to be limited to a single geographic region. Again this assumption was tested by comparing the mean scores for the two groups. As expected, full service hotel chains had significantly higher GRIs ($p > 0.05$) than their economy sector colleagues, as can be seen from Table Three.

Table 3. T-Test findings

GRI	n	Mean	Significant
Overall	50	55%	
Headquarters in the U.S.	35	50%	
Headquarters outside the U.S.	15	67%	$p > 0.01$
Economy sector	23	49%	
Other	27	62%	$p > 0.05$

CONCLUSION

For companies truly wishing to serve a global customer base, adapting their website to take into account the language, culture and social norms of local marketplaces has become a key issue. This study benchmarks the efforts of the top fifty hotel chains to incorporate appropriate content and facilities on their website as an indicator of their commitment to servicing international markets.

Both the individual findings and the summary Global e-Readiness index suggest that at present the major hotel chains are not very global in their e-commerce efforts. While many provide content in languages other than English, in most cases the spectrum of pages available in the alternative language is limited. Even the "best" performers often fail to take their internationalization efforts deep enough into the purchase process to allow non-Anglophone customers to complete reservations in their native languages and using local norms. As can be seen from the cluster analysis, the majority of companies had sites that targeted the market of their country of origin, and made few concessions to addressing international audiences. US companies in particular perform badly; having in effect generic websites that fail to address linguistic, cultural or other internationalization issues, despite the importance of non-Anglophone and non-Caucasian audiences within their key market.

In light of the changing consumer landscape of e-commerce, and in particular the increasing percentage of non-English speaking web users, such an approach is short sighted and puts such companies at a disadvantage. Hotel companies wishing to take advantage of the continued growth in online travel sales need to become more proactive about incorporating appropriate culturally adapted content and facilities into their sites to effectively address the needs of their target markets. This should include not only linguistic elements to go far deeper and address the more ingrained cultural elements of each segment. Localization needs to become the norm rather than the exception.

As with most research, this study suffers from several limitations. Firstly, websites by their very nature are dynamic, but were assessed at only a single point in time. A longitudinal approach would not only overcome this limitation, and would also allow how (or if) website design and content are evolving to be assessed. Secondly, the focus on hotel chain websites means that results cannot be generalized to the industry as a whole, and indeed a similar study of independent hotels in particular might generate very different results. However, prior studies in technology adoption have argued that it is the major chains that have the budget, expertise and global presence to engage in e-commerce in a professional manner and thus studying their performance gives a useful indicator of best practice in the industry as a whole. In a related issue, the use of brand websites in the study means that the performance of certain companies may be unduly influencing the results. Several hotel companies (e.g. Accor Hotels & Resorts, Wyndham Worldwide) own multiple brands within the list of

top fifty hotel companies. In such cases back end technology is often shared across such brands, meaning that the content and facilities provide on their brand websites may be similar and thus may have biased the findings due to double counting. To overcome these two challenges, a larger scale study, using a more representative sample of the industry as a whole, should be undertaken to more accurately benchmark current industry practices.

Finally, the GRI, as it is currently implemented, assigns equal weight to each of the variables assessed, which is unrealistic. In reality certain variables (such as, for example, the availability of several languages, or having localized content) would have a more significant effect on the usability and acceptance of a website by international clients than others (such as, for example, the date format required). A more appropriate weighting system, taking the relative importance of each issue into account, needs to be developed and empirically tested. Multi-country consumer based research could be used to address this question. Such a study would turn the GRI into a more powerful assessment tool, and would be invaluable in helping companies focus their localization and globalization process.

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A STUDY OF TRAVEL AGENCY COLLABORATION AND CO-CREATION IN THE TOURISM INDUSTRY

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ABSTRACT

This study explores the dynamics of collaboration between travel agencies and their suppliers in co-creating value with their customers. It examines the relationship among six collaboration elements (co-creation dynamics), service innovation, competitive advantage, technology adoption and environmental change, and the moderating effect of trust on the co-creation elements and service innovation. The effects of technology adoption and environmental changes on the six elements were also examined. Results indicate that all the above effects are significant, and trust enhances the effect of the elements on innovation for Taiwan travel agencies. However, technology adoption and trust differed for the Malaysian travel agencies.

Keywords: Co-creation Dynamics, Relational view, Service Dominant Logic.

INTRODUCTION

Continued growth in the global tourism industry has opened vast opportunities to many businesses in the tourism and hospitality industries. In the first two months of 2011, international visitor arrivals already had surpassed those of the previous year same period by 5 million. Total international tourism receipts in 2010 were estimated at US\$919 billion, which represents a 5 percent increase over 2009, and with the current growth rate estimated at 6 percent, receipts could reach US\$975 billion (World Tourism Organization, 2011). The top five global 'biggest spenders' countries that have mainly contributed to this growth currently rank as (from largest) Germany, US, UK, China and France, and are tied to increases to their citizens' disposal incomes (CNNGo.com, 2010). Being one of the largest worldwide industries and the most complex as it overlaps many industries, including, accommodations, transportation, restaurants, etc., tourism supports more than 258 million jobs and generates approximately 9.1 percent of the global gross domestic product (World Travel & Tourism Council, 2011). Growth can also be attributed to advances in web and information technology (IT) that have changed the service landscape to favor consumers through e-marketing and social networking. The consumer can shop online to find the best perceived value, and review the comments and experiences of others. However, tourism trends have shifted from mass traveling to individually customized and thematically oriented with the rise in personal wealth and leisure time (Chen et al., 2009). As businesses in the tourism industry jockey for position to lure potential customers and take advantage of these trends, several will join forces and collaborate to offer customized services

that may exceed their (customers') expectations. Furthermore, interacting with them (customers) will lead to opportunities to co-create extraordinary value that enhances the travel experience.

Value co-creation involves the customer deriving value through his/her use of a product or service offering, and his/her involvement in the co-design and co-production of the offering (Michel, Brown and Gallan, 2008). It is defined as "a constructive customer participation in the service creation and delivery process requiring meaningful and cooperative contributions" (Auh et al., 2007, p. 367). The value of a product or service is no longer defined by the producer or provider, but by the level of satisfaction a customer attains as a result of using the offering (Gummesson, 1995). With the advent of value co-creation, the dominant marketing logic has clearly shifted to service-dominant (S-D) logic, which emphasizes the integration of goods with services (Vargo and Lusch, 2004). Under S-D logic, regardless of whether the offering is a tangible good or a service, it becomes a vehicle that enables customers to pursue their individual satisfaction through the accomplishment of a task or gains in efficacy (Michel, Brown and Gallan, 2008). Thus, service is now the common denominator to any offering (Payne, Storbacka and Frow, 2008). Vargo and Lusch (2004) define services as "the application of specialized competences (knowledge and skills) through deeds, processes, and performances for the benefit of another entity or the entity itself" (p. 2); this provides the philosophical foundation for S-D logic.

Prior empirical studies have focused on the relationship between a seller and consumers in a business to customers (B2C) context (e.g., Chan, Yim and Lam, 2010). However, few studies have examined the relationship between a seller working collaboratively with multiple suppliers and consumers. This study examines the dynamics of collaborations between travel agencies and their suppliers to innovate and co-create value with customers in Taiwan and Malaysia. In recent years, consumers have gained an upper-hand in travel shopping through the advances in web and information technologies. They have enabled and given consumers the advantage to easily search different sites to locate and purchase the deal that might best match their travel needs through online bookings in the comforts of their home. Yet, in spite of this convenience, this was often not the case. Consumers often lack critical pieces of information or the knowledge an experienced travel agent will possess. As such, travel agents still play an important role in the tourism industry (World Tourism Organization, 2006). Collaborations throughout the tourism supply chain using the same technology that has enabled

consumers may return the advantage to travel agents, but in the role of travel consultants. Yet, the dynamic nature of both tourism and IT may affect the collaborations between travel agents and their suppliers as there needs to be a common ground on which they can build their collaborations. Thus, the adoption to technological changes and market shifts are predicted as essential collaboration success factors.

BACKGROUND

Service dominant (S-D) logic (Lusch and Vargo, 2004) and the rational view of cooperative strategy (Dwyer and Singh, 1998) provide the conceptual foundation for this study. The intersection of these concepts lies service, the primary determinant of competitive advantage (or failure). Both assume that regardless of whether a business offers a product or service, the offering must envelop a service which creates value (vs. embedding value during the time of production). As Gummesson (1995) states, “customers do not buy goods or services: they buy offerings which render services which create value” (pp. 250-251). Furthermore, value is no longer added through the production process, but through the customer’s use of the product or service. The challenge lies in discovering and understanding what the customer perceives as value and how to derive it.

Service Dominant (S-D) Logic

As marketers have adopted a customer-centric focus (Sheth, Sisodia and Sharma, 2000), learning (Slater and Narver, 1995) and market driven orientations (Day 1999), a customer centricity and service-centered view of marketing has emerged. In contrast to the traditional good-based marketing practices (i.e., good dominant logic) that embrace a product- or production-orientation (i.e., manufacturing-based model), customer centricity and service-centered involve continuous collaboration with customers to learn and understand of their needs (Gummesson, 2008; Vargo and Lusch, 2004) through relationship development, communicative interactions and knowledge renewal (i.e., knowing how to improve customer experiences) (Ballantyne and Varey, 2006). The result is a customized offering that best meets and satisfies the customer in utility and value. Thus, with collaborations, the customer becomes the co-designer and co-producer of the offering, regardless of whether it is a product or service, and co-creator of value (Vargo and Lusch, 2004). Under a services view, “physical good marketing and services marketing converge, but services-oriented principles dominate” (Gronroos, 2000, p.88), and the service that the offering renders creates value. Placing the focus on the customer has now become the prerequisite for survivability and profitability (Gummesson, 2008), and co-creation becomes the basis for value (Prahalad and Ramaswamy, 2004).

S-D logic incorporates collaborative processes among customers, partners and employees, reciprocity in service provisions between a business and its exchange partners while engaged in co-creation, commitment from

management to service all stakeholders, and the adoption of the new service paradigm to its practices (Lusch, Vargo and O’Brien, 2007). It comprises nine foundational premises: the application of specialized skills and knowledge is the fundamental unit of exchange, indirect exchange masks the fundamental unit of exchange, goods are distribution mechanisms for service provision, knowledge is the fundamental source of competitive advantage, all economies are service economies, the customer is always a co-producer, the enterprise can only make value propositions, a service-centered view is customer oriented and relational, and organizations exist to integrate and transform micro-specialized competencies into complex services (Vargo and Lusch, 2004; Vargo and Lusch, 2006).

Vargo and Lusch (2004) also base S-D logic on a distinction between operand and operant resources. Operand resources refer to those that an operation or action is performed upon to produce an effect, and are characterized as physical (e.g., factories, materials, etc.). In contrast, operant resources produce an effect. They are typical human, organizational, informational, knowledge, and relational (Hunt, 2004). With a service orientation, operant resources are more capable of providing competitive value propositions and assessing marketing outcomes (Li and Petrick, 2008). As such, they point out that the business’ interactions with its environment increase its operant resources and enhance its ability to provide solutions.

In the tourism industry, S-D logic has been tied to knowledge building and exchange as they are a source of competitive advantage and economic growth (Li and Petrick, 2008). Because tourism is a service-driven industry (Seaton and Bennett, 1996), advances in IT have enable interactive dialogues and direct interfaces between buyers and sellers (Palmer, 1996; Sheth and Parvatiyar, 1995), and the service provided throughout the tourism industry can be characterized as knowledge embedded, customer oriented and technology driven (Lohr, 2006), S-D logic appears to be a natural fit (with the tourism industry). National tourism organizations (NTO) find it critical and of particular importance to create, share and utilize customer information to streamline marketing communication, improve product innovation, and enhance destination-traveler relationships (You, O’Leary and Fesenmairer, 2000).

Relational View

Typically, businesses secured a competitive advantage by accumulating resources and capabilities that were rare, valuable, non-substitutable and difficult to imitate (Barney, 1991; Dierickx and Cool, 1989; Rumelt, 1984). Yet, in many cases, these resources extend beyond the business’ boundaries. The resource-based view (RBV) assumes a single business owns and controls the resources and capabilities. However, businesses that collaborate and combine their resources in unique ways may reap non-duplicable advantages (Dyer and Singh, 1998). In contrast to RBV, the relational view focuses on dyads/networks,

and proposes that maintaining inter-organizational relationships will generate competitive advantages through operant resources that an individual business cannot create by itself (Dyer and Singh, 1998). Four potential sources of relational rents or performance gains through inter-organizational collaborations identified by Dyer and Singh (1998) include: (1) relation-specific assets, (2) knowledge sharing routines, (3) effective governance, and (4) complementary resources and capabilities. Relation-specific assets are specialized assets, and may include production site proximity of the businesses, capital investments in a physical asset that is specific to the relationship, and complementary knowledge embedded in human assets of the businesses (Williamson, 1985).

Knowledge sharing routines are often the basis for innovation. Superior knowledge transfer mechanisms among suppliers, users and manufacturers through production networks have often led to businesses out-innovating their competitors (Von Hippel, 1988). Inter-organizational learning in the context of knowledge sharing has been identified as a critical component to competitive success (Levinson and Asahi, 1996; March and Simon, 1958; Powel et al., 1996). As such, Grant (1996) defines knowledge sharing as interactions that promote the transfer, recombination or recreation of specialized knowledge.

Value creation is frequently produced through effective governance between the collaborative partners as it focuses on minimizing transactional costs or providing incentives for value creation initiatives (Dyer and Singh, 1998). Because collaboration involves the efficient deployment of resources between partners, a governance structure that stipulates the conditions and terms of their agreements and the means for value creation must be put into place.

Lastly, leveraging complementary resources and capabilities between two businesses can lead to synergistic outcomes that neither collaboration partner could have achieve by itself. Businesses achieve a competitive advantage when the outcomes are more valuable, rare and difficult to imitate (Dyer and Singh, 1998). Identifying complementarity weighs heavily in the collaboration's success (Dyer and Singh, 1998) as prior research suggests incompatibilities have led to failure (Buono and Bowditch, 1989).

Few studies have examined the relational view in the context of tourism despite the ubiquity and competitiveness of the industry. In one study that focused on the hotel industry, Rodriguez-Diaz and Espino-Rodriguez (2006) found that the success of inter-organizational integration of resources depends on the operational aspects that lead to additional rents (i.e., performance gains), improving the efficiency and effectiveness of processes, and trimming activities that do not create value to the consumer.

RESEARCH MODEL

Figure 1 depicts this study's proposed research model. The model suggests that six co-creation dynamics elements will positively influence the level of service innovation and in turn service innovation will increase competitive advantage. Technology adoption and environmental change positively affect co-creation dynamics, such that the more inclined a business is towards adopting new technology to leverage its resources and bridge relationships to advance its collaboration efforts, and adapting to environmental changes, the greater its ability to co-create. Trust as a moderator will enhance the relationship between the co-creation dynamics (elements) and service innovation. When trust is high, the co-creation dynamics will have a greater effect on service innovation. Five hypotheses are presented to determine the proposed model's predictability.

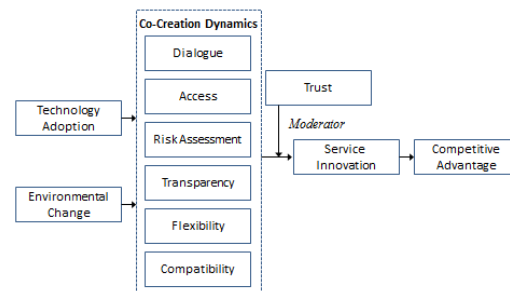


Figure 1. Proposed research model

The dynamic nature of market conditions and the ever-changing customer needs require continual interactions between a travel agency and its customers to learn and understand their (customers') needs, and engage in meaningful dialog to co-create value. Since travel agencies connect services to customers, they heavily rely on their supply chain. As the relational view suggests, collaborating businesses (i.e., a business and its suppliers) can reap non-duplicable advantages when they combine their resources and share their knowledge. This study defines co-creation dynamics as a process of value creation between a business and its suppliers through collaborative elements. It is characterized as a continuous social and economic process that begins with an interactive definition of the customer's problem (Deighton and Narayandas, 2004). Prahalad and Ramaswamy (2004) have identified four fundamental collaborative elements (or building blocks) of co-creation: dialogue (i.e., interactivity, engagement, propensity to act), access (i.e., sharing of information and knowledge), risk assessment (i.e., providing information to make informed decisions), and transparency (i.e., openness) (DART). These elements are crucial to the interaction process between the travel agency and its suppliers. By coupling them in different combinations (e.g., dialog and access, risk assessment and transparency, etc.), a business can apply them towards developing different strategies with its suppliers (Prahalad and Ramaswamy, 2004).

In a B2B setting, compatibility and flexibility reflect the fit of the relationship between business partners (e.g., travel agency and supplier) that are conducive to collaboration.

Flexibility defines the responsiveness of a business to adapt to changes in technology and market opportunities by introducing new offerings, broadening its product line, and upgrading its offerings with greater timeliness (Dwyer and Singh, 1998). The effect is to enhance co-creation between them. Often, efficient collaborations between a business and its supplier are the key success factors for providing superior service to customers in order to gain their satisfaction and loyalty. In the tourism industry, travel agents play an important role as the coordinator between their suppliers and customers.

In contrast, compatibility describes the extent to which orientations, abilities, and activities of the businesses play toward their successful integration. Also, the complementariness of their resource needs will affect their efforts to co-coordinate. In an inter-organizational context, Vargo and Lusch (2008) have found that the degree of compatibility between (among) partners can predict of the success or failure of joint ventures. Greater compatibility between partners segues to higher co-creation capability. From the customer's perspective, compatibility would appear as a seamless offering.

Service innovations can be defined as a new service experience or service solution that involves a new service concept (i.e., value that is created by the service provider in collaboration with the customer), a new customer interaction (i.e., the role customers play in the creation of value), a new value system/business partners, a new revenue model (i.e., new value system or set of new business partners involved in co-producing a service innovation), a new revenue model (i.e., developing the right revenue model to fit a new service concept), and/or a new organizational or a technological service delivery system (i.e., organizational or technology infrastructure), and leads to a new or renewed service function, experience or solution (den Hertog, van der Aa and de Jong, 2010). They (service innovations) often result from collaborative networking rather than a single source (Vries, 2006). For example, alliances allow businesses to acquire new skills and knowledge from other alliance members which opens opportunities for innovations (Hagedoorn, 1993; Hamel, 1991). The six co-creation dynamics elements provide the foundation on which productive collaboration between a travel agency and its suppliers can be built, and promote innovative thinking. The presence of these elements opens opportunities for greater service innovation. This study proposes that co-creation dynamics has a positive effect on service innovation.

H1: Co-creation dynamics have a positive effect on service innovation.

"Innovation is a critical activity that is virtually important for most firms to embrace in order to create and sustain a competitive advantage" (Johannessen, Olsen and Lumpkin, 2001, p. 27). It has been identified as a key element to business success (Nonaka and Takeuchi, 1995). This is particularly true for the tourism industry where service innovation is crucial for gaining and sustaining a competitive advantage (Chen et al., 2009). Yet, service

innovations often provide only a short-term advantage as factors that were attributed to the past success may no longer be relevant (Sakchutchawan et al., 2011), and the need to sustain service innovations becomes necessary to retain competitive advantage. With value co-creation, the customer becomes an active participant in the production process, during which time the travel agency and its suppliers combine their resources to define the customer's needs (i.e., relational view) and innovatively work with the customer to produce a customized offering superior to everything else (i.e., S-D logic). Thus, competitive advantage can be tied to the distinctive value the customer realizes through the offering's use (Vargo and Lusch, 2004), which resulted from a service innovation. As such, service innovations will improve the competitive advantage of the business.

H2: Service innovation has a positive effect on competitive advantage.

Advances in information and web technologies have led to the quick and easy access of information that businesses can use to sense market opportunities and changes, and enable competitive advantages. As a result, IT has become a powerful means to gain competitive advantage by leveraging the business' resources (Powell and Dent-Micallef, 1997), and helping bridge relationships between a business and its customers to learn about and communicate with one another (Tippins and Sohi, 2003). It also plays a significant role in the process of value co-creation and inter-business relations (Della Corte, Savastano and Storlazzi, 2009). Prahalad and Krishnan (2008) indicate that advances in IT have enabled co-creation through global networks which in turn promotes innovativeness. Prior studies (e.g., Andreau et al., 2010; Chang and Wong, 2010) suggest that IT adoption in the tourism industry has led to significant performance improvements and increases. Businesses that have adopted technology and learned to leverage it have become astute in their practices of innovation and co-creation. Thus, those that are most successful at it will be better positioned as co-creators.

H3: Technology adoption has a positive effect on co-creation dynamics.

Periodic changes in the environment, such as changes to customer preference, the erosion of industry boundaries, changes to social values and demographics, the introduction and implementation of new government regulations, and advances in technology, will pressure businesses to commit to their strategic decisions or face failure (Damanpour and Gopalakrishnan, 1998). They suggest that businesses must adopt innovative solutions that are appropriate to the environmental conditions in order to survive. The changing competitive landscape has also forced businesses to seek creative and flexible methods to meet the challenges in building collaborative relationships with their customers and suppliers (Donney and Cannon, 1998). Therefore, those travel agencies that can quickly adjust to environmental changes will by their nature be more inclined in innovative practices as they

apply to co-creation dynamics.

H4: *Environment change has a positive effect on co-creation dynamics.*

Trust is a fundamental element in every relationship, and can be defined as the confidence a person places on another in an exchange relationship, such that the other person will not exploit his/her vulnerabilities (Dwyer and Chu, 2003). Because trust is built gradually and consistently over time through a process of interactions, it is earned and does not come easily (Bstieler, 2006). Prior studies suggest that trust can reduce search cost after acquiring trustworthy partners (Gulati, 1995), plays the role of an indicator of future transactions in a buyer-seller relationship (Doney and Cannon, 1997), and works as a reduction element in relational risk (Nooteboom et al, 1997). This study applies trust to inter-organizational relationships between partners, and is essential to their innovative service collaborations to assure each is working in the best interest of the relationship. Because greater levels of trust will enhance the effects of co-creation dynamics on service innovation, trust is proposed as a moderator of the relationship (between co-creation dynamics and service innovation). As proposed in this study, trust can enhance the relationship, such that the higher the level of trust, the greater productive output resulting in service innovation since partners will be less distrustful and suspicious of the intents of the other, and not hold back for fear of being exploited. In the tourism industry, collaboration can be the single most important aspect of effective management (Fyall and Garrod, 2005). Prior studies in tourism have identified trust as a necessary condition for successful collaboration (e.g., Bucklin and Senguta, 1993; Devine, Boyle and Boyd, 2009; Waddock and Bannister, 1991).

H5: *Trust moderates the relationship between co-creation dynamics and service innovation.*

The proposed research model examines the effects of collaboration between (among) business partners (i.e., travel agencies and their suppliers) in their participation as co-creators with consumers on their ability to innovate to gain or maintain a competitive advantage. S-D logic and the relational view form the basis for a collaborative marketing paradigm that involves the customer as a co-creator of service and suppliers as collaborators (with travel agencies). Regardless of whether an offering is tangible or intangible, the customer seeks value through its use. Other factors that were examined include inclination towards technology adoption, adaptability to environmental changes, and trust.

METHODOLOGY

Data were collected through a survey of travel agencies in Taiwan and Malaysia. A questionnaire with forty-nine psychometric items that were adopted from prior studies (Table 1) and five demographic questions was developed. The items were measured on a five-point Likert-type scale (1 = strongly disagree, 5 = strongly agree). Because the

survey was conducted in Taiwan and Malaysia, Chinese and English (language) versions were developed. To ensure nothing was lost in the translation to Chinese (from English) and both were capturing the same measures, the questionnaire was translated back to English. When necessary, language adjustments were made to the Chinese version.

Lists of travel agencies were obtained from the Tourism Bureau of the Ministry of Transportation and Communication, Taiwan, and Tourism Malaysia. Travel agencies in Taiwan are categorized as consolidated (wholesaler), Class A, and Class B, the latter two being retailers and differentiated by their capitalization. For this study, only consolidated and Class A travel agencies were included in the survey. Only travel agencies in west Malaysia were targeted.

Six hundred sixty (660) questionnaires in Chinese were mailed to travel agencies in Taiwan and 458 in English to others in Malaysia. The questionnaires were addressed to the managing directors and general managers of the agencies, and were accompanied by a letter introducing and explaining the purpose of the survey and a pre-addressed stamped return envelope. To encourage participation among the Taiwanese travel agencies, a donation of NT\$100 (approximately US\$3.50) would be made to a charity of their choice upon the receipt of their completed questionnaire. After three months, 105 usable questionnaires from Taiwan were received, and 102 from Malaysia (for a total of 207), giving response rates of 15.9 and 22.3 percent, respectively.

ANALYSIS AND RESULTS

An exploratory factor analysis was conducted on the six co-creation dynamics elements. The maximum likelihood method was used to extract the initial factors. An oblique rotation method was applied to take into the account the correlations among the factors (Pedhazur and Schmelkin, 1991). Table 2 shows the results of the loadings and cross loadings.

A structural equation model (SEM) in partial least squares (PLS) was developed to assess the adequacy of the model through the examination of construct reliability, and convergent and discriminant validity. The data were separated by country for the analysis. As shown in Tables 3 and 4, all constructs exceed the recommended minimum cutoff of .70 for composite reliability (Straub, 1989). Cronbach alpha assessed the reliability of multiple scales, following the guidelines of Nunally (1978) and Churchill (1979). Except for environment change (construct), all Cronbach alpha values exceeded the recommended .70 (Nunally, 1978). Although the Cronbach alpha values (for both the Taiwan and Malaysia data sets) were below the recommended minimum, they are still within an acceptable range.

Convergent and discriminant validity were assessed using average variance extracted (AVE). The average variance extracted (AVE) values for both data sets (Tables 5 and 6)

exceed the recommended minimum of .50 to demonstrate convergent validity (Barclay et al., 1995). This suggests that the measurement items within each construct are related to one another and support the theorized construct (Gefen and Straub, 2005). Tables 5 and 6 also show the AVE values are less than the squared correlations of the two compared constructs that appear along the diagonal. This demonstrates discriminant validity, and suggests the measure items are weakly related to other constructs (Gefen and Straub, 2005).

The partial least squares (PLS) method was used to develop a structural equation model (SEM) of the data sets since PLS has a high tolerance with small to medium sample sizes (Chin, Marcolin and Newsted, 1996). Three control variables, firm size, firm capital and firm age, were introduced to the model to verify that none has an influence on service innovation, competitive advantage and the outcome. For example, a business' age, size or capital should not be a determinant of its ability to innovate. The SEM results of the Taiwan data set appear in Figure 2 and Table 7. All path coefficients between the constructs are statistically significant which lends support to H1, H2, H3 and H4. Because none of the paths for the control variables is significant, firm size, firm capital and firm age do not influence the effects. Table 8 summarizes the moderating effect of trust on the relationship between co-creation dynamics and service innovation is summarized. Model 1 tests the direct effect of trust on service innovation and model 2 the interaction of trust and co-creation dynamics on service innovation. The significance of the direct effect in model 1 and the interaction effect in model 2 supports H5. Thus, trust enhances the effect of co-creation dynamics on service innovation: the greater the trust, the more likely collaborations between a travel agent and its partners will lead to increases to service innovations.

Figure 3 and Table 8 contain the SEM results for the Malaysia data set. With the exception of technology adoption, all path coefficients are significant and therefore support H1, H2 and H4. In contrast to the Taiwan model, firm age has a significant effect (.16, $p < .05$) on competitive advantage. This might suggest that other factors related to time may be giving established travel agencies a competitive advantage. These may include reputation, closeness to the community, and/or client base. Otherwise, none of the other control variables has a significant effect on service innovation and competitive advantage. The results of the test for the moderating of trust appear in Table 9. Because the direct effect of trust on service innovation is not significant, H5 is not supported.

DISCUSSION

This study examined the effects of six co-creation dynamics elements on service innovation, service innovation on competitive advantage, and technology adoption and environmental change on co-creation dynamics, and the moderating effect of trust on the relationship between co-creation dynamics and service

innovation. The co-creation dynamics elements embody the underlying collaborative principles of the relational view; businesses that combine their resources may gain competitive advantage through the uniqueness of their offering. Furthermore, the elements are directed towards co-creation based on the marketing paradigm of S-D logic. The results indicate that collaboration between (among) partners in the context of co-creation with customers and as represented by the co-creation dynamics elements will have a positive effect on their ability to innovate services (value), and consequently gaining or maintaining a competitive advantage. For meaningful co-creation to occur, particularly for customers seeking value through a travel experience, travel agencies must collaborate with their suppliers to examine numerous possible offerings that satisfy what the customer envisions. For example, in co-creating a travel package for a customer who is interested in backpacking and exploring geological formations in Malaysia, a travel agent might work with a hotel that would fit the travel theme (i.e., thematic orientation) and provide the type of lodging that would not only be consistent with the them, but also enhance the travel experience of the customer. A transportation service would be enlisted to eco-friendly travel that is also consistent with the them and enhances the travel experience. The collaboration between the travel agent and its suppliers would result in a service innovation in the form of a unique and customized offering to the customer. The success of such a travel offering lies in the degree to which the six elements of co-creation dynamics (dialogue, access, risk assessment, transparency, flexibility, compatibility) are present or combined to influence the outcome. While dialogue, access, risk assessment and transparency address the ability of the businesses to exchange and circulate information and knowledge between each other, flexibility and compatibility determine the extend to which they can work together in proposing a seamless offering to the customer.

The mixed results suggest trust will enhance (moderate) the effects of partner collaborations on service innovation under certain circumstances. As seen in the Taiwan data set, trust was a moderator of the relationship (between co-creation dynamics and service innovation). Yet, the Malaysia data differed and the moderating effect was not present. The measures of this study were not able to capture the reason for this mixed result, and future studies might include other variables to better understand the presence of the effect. Although prior studies suggest trust is a necessary condition for successful collaboration (e.g., Bucklin and Senguta, 1993; Devine, Boyle and Boyd, 2009; Waddock and Bannister, 1991), it may not be readily apparent for service innovation. Instead, partnerships may be more contractual to ensure the responsibilities of the partners are identified and each is held accountable to them. Yet, the positive results of the Taiwan data set suggests an encouraging sign.

In recent years, travel agents have been faced with new technological challenges. Online travel agents, such as Travelocity, Expedia and Orbitz, have been very successful in satisfying the increasing travel needs of

world-wide consumers. Their online services allow customers to one-stop-shop for airfares, hotels, car rentals, cruises and vacation packages, and self-assemble travel packages. Yet, in spite of their vast online offerings, they mass-market travel, compete on price, and provide little in co-creation. The more seasoned travelers and vacationers will seek value through their experience (i.e., as they partake in their travel). The difference between the two groups may be described as passive spectators vs. active participants. Thus, getting the customer involved in the creation process can lead to new services or service innovations that would in turn provide a competitive advantage through customized offerings that cannot be readily duplicated, imitated or substituted (Peppard, 2000). The results of this study lend support to this relationship between service innovation and competitive advantage.

Another new technological challenge travel agents face is social and consumer generated media. Information from these media have begun heavily influencing the travel plans of many travelers; 71 percent of the consumers are influenced by consumer generated media, and 66 percent by consumer reviews posted on social media (Vinod, 2011). Also, the trend towards individual customized and themically oriented travel due to increases in discretionary income and leisure time (Chen et al., 2009) has shifted the market away mass-travel. Thus, these changes to the market landscape and advances in technology have presented new challenges, and compelled travel agents and their suppliers to adopt to new business models to include collaboration based on the relational view and service-based co-creation embodied in S-D logic. As the data indicate, the ability to adapt to environmental changes will influence co-creation dynamics as it suggests a necessary alignment between the businesses that identifies their willingness to adapt, and bodes well for collaborative partners.

A difference in technology adoption appeared between the two data set. The Taiwan data suggest technology adoption plays importantly towards co-creation dynamics (collaboration). Yet, this is not seen in the Malaysia data. Generally, advances in technology have impacted the way business is conducted over all industries, often enabling and/or integrating businesses. However, technology adoption may depend on other factors as suggested by the strategic grid (McFarlan, Cash and McKenney, 1992). The degree to which businesses adopt technology may lie in the extend to which they assign technology to leveraging their business functions. Further investigation of this aspect is needed to determine the reason for the difference.

CONCLUSION

This study examined the collaborative relationship between travel agents and their suppliers to co-create offerings and value with their customers. Data were collected through surveys conducted in Taiwan and Malaysia. The results positively linked collaboration (co-creation dynamics) to service innovation, and service

innovation to competitive advantage. Six elements represented collaboration based on the relational view, four of which emphasized information and knowledge exchange and flow (dialogue, access, risk assessment, transparency) while the remaining two (flexibility, compatibility) their working relationship. Their readiness to adapt to changes due to market shifts contributed to their successful collaboration. Due to difference in results between the Taiwan and Malaysia data, the role of trust (as a moderator) and technology adoption play is uncertain.

In recent years, large online travel agents, such as Orbitz, Expedia and Travelocity, that cater to the masses have challenged small agencies to find better ways to meet the traveling public's need for individual customized and thematically oriented travel. The co-creation of offerings that provide value through their use has been based on S-D logic and collaboration between travel agents and their suppliers in the context of the relational view offer means for meeting these challenges.

References, figures and tables available upon request.

AN EXAMINATION INTO THE DETERMINANTS OF POSITIVE AND NEGATIVE ELECTRONIC WORD-OF-MOUTH COMMUNICATION

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ABSTRACT

The Internet has empowered consumers. More and more marketers attempt to harness the power of word-of-mouth communication in the online environment. In this paper, we attempt to explore the underlying motives for consumers engaging in both positive and negative eWOM communication. The findings reported here indicate that consumers engage in positive eWOM mostly for altruistic, self-enhancement, reciprocity, and sense of belonging. In contrast, consumers engage in negative eWOM for altruistic and venting negative feeling. The results of this exploratory study showed that though eWOM behaviour is the same, the underlying motives are very different. Thus, we recommend future research should clearly specify whether they are investigating PeWOM or NeWOM, and researchers should continue to identify corresponding theories to explain the two different eWOM phenomena.

Keywords: Electronic word-of-mouth communication, Online consumer-opinion platforms, Positive eWOM, Negative eWOM, Social Media.

INTRODUCTION

The rapid development and public popularity of social media (e.g., social networking sites, micro-blogs, instant messaging, online consumer-opinion platforms, and etc) cultivate the endless stream of comments, opinions, and personal stories about any and every company, product, service or brand. Consumers now can easily post and share their purchase experiences with other consumers with a click of the mouse. This new form of communication is called “*Electronic Word-of-Mouth (eWOM) communication*”. Similar to traditional WOM communication, eWOM communication in general is seen as more credible than traditional marketing and advertising channels [16][22][26]. Recent studies showed that consumers find that the best advice mostly from strangers who have similar interests or who embody a lifestyle the consumer aspires to achieve [21]. eWOM via online consumer-opinion platforms becomes increasingly influential. ChannelAdvisor [7] also

found that consumers have increased the number of reviews they read and the overall time they spend reading them.

The significance of eWOM communication has not gone unnoticed by the academic community. A lot of academic studies have already demonstrated the power of eWOM in influencing consumer purchase decision [12][25][28], as well as market sales [13][16][32]. In addition, researchers have shown that word of mouth is a good measure to capture both loyalty and advocacy among existing customers [18][29]. A few studies have already provided initial insights into the drivers of spreading electronic word of mouth [3][22][31]. However, the motives underlying negative electronic word of mouth is still an unexplored research area. Prior studies in marketing suggested that consumers pay more attention to negative information than positive information. We believe that identifying the motives underlying negative eWOM should also deserve attention. Therefore, the purpose of this study is to identify the motives for spreading positive electronic word of mouth (PeWOM) and negative electronic word of mouth (NeWOM) in social media, particularly in online consumer-opinion platforms.

The paper is structured as follows. First, we will review prior literature on both traditional WOM communication and eWOM communication. Second, we will build on the social psychology literature and propose a framework for identifying motives of eWOM communications. We will then describe an exploratory study and report the key motives for both PeWOM and NeWOM communications. Finally, we will discuss the results and present future research directions.

LITERATURE REVIEW

In this section, we will first address prior studies on WOM communication and eWOM communication. We will then provide our review and analysis of prior studies pertaining to the motives of positive and negative eWOM communications.

Word-of-Mouth Communication

Word-of-mouth (WOM) communication refers to

“oral, person-to-person communication between a perceived non-commercial communicator and a receiver concerning a brand, a product, or a service offered for sale” [2]. A great number of studies have illustrated that WOM is more effective than traditional marketing tools of personal selling and conventional advertising media [17], because people tend to perceive personal sources (e.g., consumer-generated WOM), as more credible than marketers or commercial sources (e.g., marketer-generated information). Past studies have also shown that WOM play a major role in consumer purchasing decisions by influencing consumer choice [2][17], as well as post-purchase product perceptions [5].

Electronic Word-of-Mouth Communication

eWOM communication is usually considered as an extension of traditional interpersonal communication into the new generation of cyberspace. It refers to *“any positive or negative statement by potential, actual or former customers about a product or company, which is made available to a multitude of people and institutions via the Internet”* [22]. eWOM can be exchanged through a variety of means such as emails, instant messaging, homepages, blogs, forums, product review sites, chat rooms, newsgroups, and social networking sites [19]. Because of the persuasiveness and the rapid adoption of social media, eWOM exhibits an influential power on consumer purchasing decision.

The topic of eWOM communication is generating increased interest in business disciplines. In recent years, we have witnessed that eWOM communication has become an emerging research area with an increasing number of publications per year [6][11]. Researchers from different disciplines adopted various research approaches to examine this important phenomenon, and a lot of attention has been paid to the effectiveness and the consequences of eWOM communication. Research on why consumers engage in eWOM communication, particularly spreading eWOM, remains very scarce.

Prior Studies on Electronic Word-of-Mouth Communication

Electronic word-of-mouth (eWOM) communication can be positive, negative, or neutral. In general, positive WOM may increase purchase intentions [15], whilst negative WOM may discourage brand choice and damage company's reputation [24]. The impacts of both positive and negative WOM communication have been extensively studied in both traditional media [1][23] and social media [26][27][30]. Our review of existing eWOM literature showed that the motives of engaging in positive and negative

eWOM are not very well-defined. Consumer engagement in eWOM communication is still an unexplored and relatively new phenomenon. The most prominent study of eWOM communication motives is by Hennig-Thurau *et al.* [22]. They built on Balasubramanian and Mahajan's framework [3] and identified main motivational categories eWOM communication in a German web-based opinion platform. Table 1 describes the key motives.

Table 1: Summary of the key motives of eWOM communications

Motives	Description	Results
Platform assistance	The moderating role of the platform are convenience and problem-solving support through the platform operator	√
Venting negative feeling	To lessen the frustration and reduce the anxiety associated	√
Concern for other consumers	To help other consumers with their buying decision, to save others from negative experiences, or both	√*
Self-enhancement	To enhance their image among others by projecting themselves as intelligent shoppers	√*
Social benefits	To receive social benefits from this community relationship	√*
Economic reward	To receive economic benefits	√*
Helping the company	To give the company “something in return” for a good experience	√
Advice seeking	To describe their experiences with a product and request other consumers to submit problem-solving information	√

(Note: √ represents the motive is identified in the study. √* represents the motive is found significant in the study)

RESEARCH FRAMEWORK

Prior literature provides a rich foundation of theory on which to build a research framework that helps identify key motives of eWOM communications in online consumer-opinion platforms.

eWOM communication can be viewed as a public-good phenomenon. A public good is characterized as *“a shared resource from which every member of a group may benefit, regardless of whether or not they personally contribute to its provision, and whose availability does not diminish with use”* [8]. According to Batson [4],

there are four main theoretical perspectives explaining public good phenomenon: egoism, altruism, collectivism, and principlism. Figure 1 presents our framework for eWOM communication.

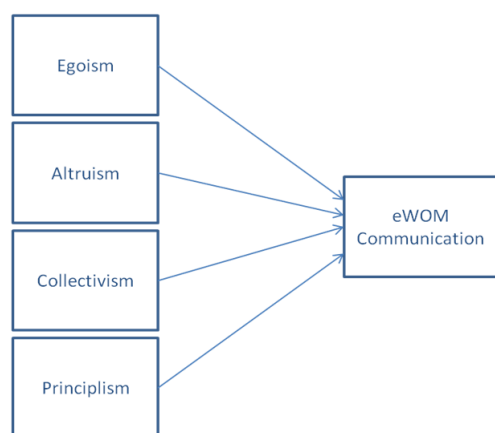


Figure 1: The Research Framework

Egoism refers to serving the public good to benefit oneself. Researchers in psychology, sociology, economics, and political sciences assume that all human actions are ultimately directed toward self-interest. Rewards and avoidance are the most obvious self-benefits that drive individuals to act for the public good. *Collectivism* refers to serving the public good to benefit a group. The act for the public good is for the group's benefit, as the self shifts from personal self to collective self. This is the most widely accepted social psychology theory of group behavior. *Altruism* refers to serving the public good to benefit one or more others. The motive for the public good can be linked to empathic emotion. Empathy (feelings of sympathy, compassion, tenderness, and the like) is a source of altruism. Some researchers have shown that feeling empathy for a person in need leads to increased helping of that person. *Principlism* refers to serving the public good to uphold a principle. The motivation is to uphold, typically, some moral principle, such as justice or the utilitarian principle of the greatest good for the greatest number.

RESEARCH DESIGN

An exploratory research approach was used in the current investigation. We conducted 40

face-to-face interviews with consumers who have engaged in eWOM communications. The respondents were asked to provide details on a recent PeWOM or/and NeWOM communication in online consumer-opinion platforms. They were also asked why they used this channel to express their comments, and whether they used other channels (e.g., traditional WOM) to spread their purchase experience with other consumers. Each interview lasted about 30 minutes. The interviews were transcribed and coded by two independent coders.

DATA ANALYSIS

In this study, 13 respondents were women and 27 were men. They were aged between 21 and 35. The proportion of positive and negative WOM experiences were 19 versus 17, and 4 interviewees provided both positive and negative eWOM in a single incidence. 14 online consumer-opinion platforms were cited in the interviews, and a variety of products and services (e.g., food, cosmetics, online games, mobile phone, and etc.) were mentioned. The average time they spent on posting comments on online consumer-opinion platforms was 5 minutes. 20% of respondents mentioned that they included photos and hyperlinks in their posts. 22.5% of respondents used more than one type of social media to spread their eWOM, and social networking site (e.g., Facebook) was the most popular type of social media they used for eWOM communication. It is interesting to find that 72.5% of respondents also used the traditional method, mainly face-to-face conversation, to spread word of mouth about their purchase experiences.

The responses to the key question in this study, "Why did you post the comment/review on that forum?", were analyzed via a content analysis. Motives for positive and negative eWOM communications are classified separately. The research framework serves as guidance in classifying the motives. Hennig-Thurau *et al.*'s [22] study further provides us with a list of categorization of motivations (See Table 1) that facilitates our coding process. The classifications and quotes of motives are summarized in Table 2 and Table 3.

Table 2: Coding of Positive eWOM Communication

Motives of PeWOM	Description	Percent (%)	Quotes (Examples)
Concern for other consumers	To help other consumers with their buying decision	(3/61) 4.92%	R25: "Because I think it's a valuable product in the current market, I would like to recommend other people who also want a new mp3." R31: "Hopefully my reply can help the person who asked about this product." R34: "I suggested a better product to other people in the forum, in order to provide more product choice for others."

Motives of PeWOM	Description	Percent (%)	Quotes (Examples)
Self-enhancement	To enhance their image among others by projecting themselves as intelligent shoppers	(9/61) 14.75%	R1: "I want be more popular in the forum, and hopefully people will find me trustworthy." R30: "I hope others (whom have similar interests) will know my comments." R33: "I think if the company's owner sees this post, he/she will recognize it's me and feels happy."
Social benefits	To receive social benefits from this community relationship	(4/61) 6.56%	R7: "I feel that those people in the forum are with the same situation with me, I feel more comfortable talking to them." R17: "I just wanted to find something to do, communicate with people on internet, and have conversation with them. Yes, I want to make friends through the forum, therefore I want to gain attention from others." R30: "It is also good to share with others as usually they will have similar feedback or response."
Economic reward	To receive economic benefits	(3/61) 4.92%	R7: "I want to get more point ... in the forum, for every thread you post, they will give u some point), those points are useful to get some exclusive info points." R17: "Gain points." R25: "Because points are required to view certain posts."
Helping the company	To give the company "something in return" for a good experience	(13/61) 21.31%	R5: "Because I really like the Burger in that shop, the shop is located in Hung Hom, and I would like to recommend this shop to other people who live in other districts." R16: "When I found a shop which is really good in service/product quality, I always feel that I wanted to help the shop and it deserves reward in return of their effort." R36: "I wanna share my movie review with others. Since I do think that movie is worth watching, I wish my review would arouse others' interest."
Advice seeking	To describe their experiences with a product and request other consumers to submit problem-solving information	(1/61) 1.64%	R7: "I want to get more idea from people with similar situation as me, as I think those people will all gather on the forum."
**Expressing positive emotions	To express positive emotions (e.g., sharing positive consumption experiences contribute to a psychological tension inside him/her)	(4/61) 6.56%	R3: "I want to share the happiness and recommend a good product to others and friends." R16: "It is because I want to share my positive feelings about the restaurant, and I want to recommend other people to go there. And I think the restaurant deserves to have better reputation." R30: "Basically to express my feeling."
**Reciprocity	The person who offers help to others is expecting returns in the future	(11/61) 18.03%	R1: "Yes, as I would help others when they're in need, therefore I think other people would do the same." R16: "Yes, like myself. I used these website a lot and I very appreciate other people's effort, therefore when I found something good, I would like to share it with others and I believe there will be some people would think the same."
**Obligation	The person feels obliged to help others by engaging in positive eWOM	(3/61) 4.92%	R19: "On ebay, there's a culture which you would normally leave a comment after purchase no matter its positive or negative, the main intention is to show other buyers if the seller is trustable. This is my responsibility to leave a comment."
**Sense of belongings	The person defines himself/herself in terms of his/her membership in that group	(10/61) 16.39%	R17: "Yes, as I have a group of friends there, I always visit the website and I found it easy to chat with people on the forum." R34: "Yes, I have many sisters on this forum." R40: "Yes, I know the people on there already."

Table 3: Coding of Negative eWOM Communication

Motives of NeWOM	Description	Percent (%)	Quotes (Example)
Platform assistance	To seek redress (e.g., when the consumer has been unable to reach the appropriate individual at the company involved in the dissatisfying exchange).	(1/31) 3.22%	R12: "As I want to tell others that iphone's battery has problem, and I think that a lot of people will see my post, and it's a convenience way to express my opinion."

Motives of NeWOM	Description	Percent (%)	Quotes (Example)
Venting negative feeling	To vent their anger, anxiety, and frustration	(10/31) 32.25%	R2: <i>Yes, a little, as I could express myself freely to something that I do not agree with.</i> R26: <i>"I do get some comfort from the replies of others."</i> R32: <i>"Yes, I feel that I'm giving fair comment."</i>
Concern for other consumers	To help others by warning them about negative consequence of a particular action.	(16/31) 51.61%	R2: <i>"The comment I saw on the website praised the food quality in the restaurant. It was described as the best one in Yuen Long. However, I think there are better ones in Yuen Long and I don't want others to waste time travelling all the way from say Hong Kong Island just because of that restaurant."</i> R14: <i>"I found that the service and the food do not worth what I had to pay. I want to tell other people it's a rip off, and to warn them not to go there."</i> R20: <i>"I was deeply upset with the situation, so I was trying to warn others about this."</i> R26: <i>"I wanted to tell other people and try to stop people to go into this shop."</i>
**Vengeance	To retaliate against the company associated with the negative consumption experiences	(4/31) 12.9%	R11: <i>"Because I want everyone to know how bad this company is, and to make others lose their confident on this company, and to have negative image about this company, so this company will lose their businesses."</i> R14: <i>"Yes, I wanted to damage their reputation by posting truth comments onto the forum, to let others to know the dark side of this posh restaurant."</i> R20: <i>"Yes, because he's paying back what he has done i.e. ignoring potential customers."</i>

Categorization of PeWOM Motivations

We have identified ten motives of PeWOM and classified them into the four major perspectives (See Table 2).

- Egoism: Self-enhancement, economic reward, advice seeking, expressing positive emotions, reciprocity
- Altruism: Concerns for other consumers, helping the company,
- Collectivism: Social benefits, Sense of belonging
- Principlism: Obligation

The classification is very similar to the categories identified by Hennig-Thurau *et al.* [22], except that platform assistance and venting negative feeling are excluded, and four new categories, expressing positive emotions, reciprocity, obligation, and sense of belonging are included. Among all these motivations, helping the company is the most frequently cited motives of engaging in positive eWOM communication. Self-enhancement, reciprocity, and sense of belonging are also frequently addressed.

Categorization of NeWOM Motivations

We have also identified four motives for consumer engagement in negative eWOM communication in online consumer-opinion platforms (See Table 3).

- Egoism: Platform assistance, venting

negative feeling, vengeance

- Altruism: Concerns for other consumers,

The first two categories are based on Hennig-Thurau *et al.*'s [22] classification. It is interesting to find that the motives for negative eWOM communication are quite different from those for positive eWOM communication (except for the motive of concern for other consumers). Among all these motives, concern for other consumers and venting negative feeling are the most frequently cited factors for engaging in NeWOM. However, some respondents agreed that leaving negative eWOM is a way to punish companies for providing bad services.

DISCUSSION AND CONCLUSIONS

The purpose of this study is to gain a better understanding of why consumers engage in PeWOM and/or NeWOM communication in online consumer-opinion platforms. The four perspectives as proposed by Batson [4] guide us in developing a theoretical framework. An exploratory study is then conducted which gives us further insights into the factors determining eWOM communications in online consumer-opinion platforms. Table 4 provides a summary of the findings.

Table 4: Summary of the Results

Theoretical Perspectives	Motives	Hennig-Thurau et al. [22]	Current Study (PeWOM)	Current Study (NeWOM)
Egoism	Platform assistance	√	NIL	√
Egoism	Venting negative feeling	√	NIL	√#
Egoism	Self-enhancement	√*	√#	NIL
Egoism	Economic reward	√*	√	NIL
Egoism	Advice seeking	√	√	NIL
Egoism	Expressing positive emotions	NIL	√	NIL
Egoism	Reciprocity	NIL	√#	NIL
Egoism	Vengeance	NIL	NIL	√
Altruism	Concern for other consumers	√*	√	√#
Altruism	Helping the company	√	√#	NIL
Collectivism	Social benefits	√*	√	NIL
Collectivism	Sense of belonging	NIL	√#	NIL
Principlism	Obligation	NIL	√	NIL

(Note: √ represents the motive is identified in the study. √* represents the motive is found significant in the study. √# represents the motive is frequently addressed. NIL represents the motive is not considered)

Implications for Research

Our literature analysis indicates that research on consumer engagement in eWOM communication remains relatively new and has only received limited attention in the scholarly literature. To enhance the understanding of this phenomenon and contribute towards the developing of the existing literature in this area, we propose a theoretical framework that includes four key theoretical perspectives in explaining eWOM communications. The findings of this study indicate that the Batson's framework is useful in the understanding of eWOM communication in online consumer-opinion platforms.

Hennig-Thurau et al.'s [22] study is one of the very first studies on eWOM communications. The eight categories only cover the perspectives of egoism, altruism, and collectivism. In this study, we have included one more perspective, principlism. A number of new motives are also identified, including expressing positive emotions, reciprocity, and vengeance (egoism) and sense of belonging (collectivism). In addition, this study examines the motives of PeWOM and NeWOM communications separately. The results of this exploratory analysis suggest that the underlying reasons that motivate consumers to spread PeWOM and NeWOM are very different. In other words, people all have different reasons for their sharing in online consumer-opinion platforms. Some care about their own reputations, some look forward to reciprocity, some concern the company, some attempt to vent the negative feelings through sharing, and some warn other consumers from bad shopping experiences. We used to think that we should encourage customers to participate and share equally; however, this expectation seems unrealistic, as eWOM communications are drawn by many different reasons. In particular, research based on individual-based approach is likely to be very limited in its ability to help understand the

complex phenomenon of social media. There is thus a need to integrate multiple theoretical perspectives if this phenomenon is to be better understood.

Implications for Practice

The proliferation of social media brings tremendous impact on the way companies conduct business with consumers. In particular, the explosion of so-called micro-media (online chat rooms, online discussion boards, blogs, wikis, and, etc.) provides retailers with expanded opportunities to gain deeper insights into their customers. In addition to the descriptive knowledge of customers, companies now can gain insights from eWOM communications in online consumer-opinion platforms. This knowledge is particularly important for retailers to gain competitive advantage over their competitors. It is therefore useful to understand what drives them to spread WOM online.

The result of this study offers practitioners some guidelines for managing eWOM. For instance, if companies want PeWOM, they simply need to do their job well and act with integrity. Our study shows that a majority of customers will say good words for the company that serve them well. In contrast, if they do the opposite, they will for sure get plenty of NeWOM.

Limitations and Future Research

One limitation of this study is that the sample is relatively small (40) and conducted in an Asian country, with a fairly narrow focus on respondents' decision on eWOM communications in online consumer-opinion platforms. Researchers have to be cautious about the generalization of the results.

Given that rigorous research on motives of eWOM communication remains sketchy and lacking, more work should be done to enrich this

line of research. For instance, valid and reliable measurement instrument for the relevant constructs in the research framework should be developed and empirically tested. In addition, further empirical testing is needed to validate the research model and to examine the relative importance of factors affecting eWOM communications.

Existing eWOM studies only focused on the motives of spreading PeWOM. The underlying motives of NeWOM are still not very well understood in the current literature. In this exploratory study, we clearly showed that the motives for PeWOM and NeWOM are very different. Given the growing interest of negative asymmetry in the field of IS [9][10], researchers should continue to explore motives of NeWOM and identify appropriate theories to explain this important phenomenon.

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THAI E-TOURISM BUSINESS PROGRESSION CLASSIFICATION

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ABSTRACT

This research aims to investigate the progression of e-business adoption in Thai tourism enterprises in order to define the progression levels. The levels of E-tourism business progression are determined in four stages: online presence, interactive online presence, electronic transactions, and enterprise integration. The survey results reveal that e-business progression of most Thai tourism enterprises remain in online presence stage. Most Thai tourism enterprises which adopted e-business have not progressed further to stage 2, 3, and 4. There are more hotels which have reached higher stages than travel agents for almost every web features. This can be implied that the tourism enterprises have not paid careful attention to details of their websites, nor do they perceive usefulness and importance of informative websites. We conclude that the lack of perceived usefulness and an importance of e-business could impede the progression to further stages.

Keywords: E-tourism, E-tourism progression, Thailand

INTRODUCTION

The Internet and web technologies have become an important component in today firm's success. A large number of businesses have deployed the Internet through their website as the selling and advertising channels. Electronic commerce thus becomes a value-added channel which allows global reach to customers [13]. The tourism industry is one of many industries which benefits tremendously from such technologies [2]. In fact, e-business technologies are fundamental to the tourism industry [3] as they possess characteristics and capabilities that compatibly support business processes in the industry. The

major potential of e-business for the tourism industry lies in its capability of being networks of information and distribution channels. Such a capability is considerably helpful because the tourism industry extensively involves diverse information and products (reservations or tickets), all of which can be delivered in digital format [1].

In Thailand, the tourism industry both directly and indirectly contributes approximately 21.3% of the country's GDP. This contribution varies from tourism employments and demands for other related supplies [20]. In 2011, domestic tourism is expected to generate almost 14,400 million USD, while expected revenue for inbound tourism is approximately 20,000 million USD [10]. Therefore, the adoption of e-business adoption by Thai tourism enterprises to the level which allows long-term competitive advantages is important to the country's overall economy.

Website development is considered an important initial step for firms to fully benefit from electronic business, as website is a channel or portal in which customers come to look for information they need for their traveling related decision-making. If Thai tourism enterprises can appropriately exploit e-business technologies, they will be able to reduce transaction costs and also create ample business opportunities, which in turn contribute to the country's economy.

This research therefore attempts to investigate the progression of e-business adoption in Thai tourism enterprises in order to define adoption levels (e.g. Information Presence level, Integration level [11]) at which most enterprises are. Such findings will be helpful in defining e-business progression levels in Thai tourism enterprises and proposing appropriate guidelines on how and what Thai tourism enterprises should implement to progress to the e-business adoption level which provides long-term strategic benefits.

LITERATURE REVIEW#

E-business technologies in the tourism industry

The majority of the tourism enterprises adopted e-business technology for marketing and sales purposes [6]. These encompassed promoting the products/services, providing information and rates, facilitating booking processes online, and delivering the products/services through email. Additionally, e-business technologies allow travel agents to further add value to their services by empowering the customers to not only search and book single components, but also to assemble and book the whole travel arrangements in real-time through web-based technologies [2]. Such concept is called dynamic packaging, which is highly complex as it involves various data sources and pre-determined packaging rules set differently by suppliers. Therefore, the dynamic packaging is provided by larger and technologically advanced travel agents such as Expedia and Travelocity.

While the Internet enables the hotels and other tourism suppliers to link to countless online distribution channels, at the other end of the value chain it also facilitates the linkages between the suppliers and innumerable partnerships [2]. However, different from those for marketing and sales activities, the e-business technologies for supply chain activities are almost always exclusively utilized by larger

suppliers, such as chain hotels and global travel agents [19]. In the travel agent sector, the large agents apply the e-business technologies to integrate with suppliers. Driven by the need for a variety of products, the large agents provided a web-based interface that links to their inventory system and allows the hotels to browse the interface and input their room rates and allotments to the inventory system of the agents. E-business becomes critical for the tourism industry, particularly in the Thai context which main revenues are from foreign travelers. Having websites and online booking channels is important for both hotels and travel agents to provide their services to customers around the world. This provides the basis for this research.

E-Business Progression

A large number of tourism enterprises have implemented and used website to drive their business [7] [16]. Some only used static website and email, while others have advanced their e-business technologies to the extent that business process reengineering was conducted for higher efficiency. Such various stages of advancement in e-business adoption have been addressed by many researchers [4] [5] [8] [9] [11] [12] [17] [18]. Table 1 shows different e-business progression stages from past researches. These researchers have proposed similar stage models of electronic business as shown in Table I.

Table I: Stage models of electronic business from prior literature

Costello and Tuchen (1998)	McKay <i>et al.</i> (2000)	Willcocks <i>et al.</i> (2000)	Rayport and Jaworski (2002)	Rao <i>et al.</i> (2003)
	No Presecne (Wait-and-see)	-	-	-
Online Presence	Static online presence	Web presence	Broadcast	Presence
Interactive online presence	Interactive online presence	Access Information	Interact	Portals
E-transaction	Internet Commerce	Further integration of process and technologies	Transact	Transaction Integration
	Internal and External Integration	E-business	Collaborate	Enterprise Integration

This kind of e-business stage models is deemed appropriate and helpful in identifying e-business

progression of a firm. The models by [11] and [9] are selected and adapted as a conceptual

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framework for this research. Four levels, including 1) Online Presence, 2) Interactive Online Presence, 3) Electronic Transactions, and

4) Enterprise Integration are identified in our framework. Details are delineated in Table II.

Table II: The research conceptual framework (adapted from [11] and [9])

Progression level	Description	Example
Level 1 – Online Presence	<ul style="list-style-type: none"> ○ Firms present themselves and their information in a static one-way communication format 	<ul style="list-style-type: none"> ○ Website ○ Product/service information ○ Contact information (e.g. address, email, map, etc.)
Level 2 – Interactive Online Presence	<ul style="list-style-type: none"> ○ Firms provide two-way communication channels online for their customers (B2C) or suppliers (B2B) 	<ul style="list-style-type: none"> ○ Online feedback form ○ Online order form (without e-payment) ○ Virtual tour ○ Online inventory database ○ Web2.0 services e.g. Facebook, Youtube, Twitter, etc.
Level 3 – Electronic Transactions	<ul style="list-style-type: none"> ○ Firms are able to offer advanced electronic transactions, such as electronic payment, electronic auction, etc. 	<ul style="list-style-type: none"> ○ E-auctions ○ Online payment service
Level 4 – Enterprise Integration	<ul style="list-style-type: none"> ○ Firms are able to integrate supply chain activities with their suppliers and customer relationship management activities with their customers 	<ul style="list-style-type: none"> ○ E-loyalty or E-reward programme ○ Extranet systems integrating travel agents and hotels

RESEARCH METHODOLOGY

We employed research triangulation as our main methodology for our study. First, we started out with a content analysis where we accumulate all relevant needed data such as the list of tourism businesses who has at least one feature; a website to promote their businesses. Second, conducted extensive literature review to come up with the features that are associated with each e-business progression stages. Third, we tried to normalize our list to ensure that there were little or no redundancy amongst the features selected. So, we consulted with three experts and practitioners from within the industry to help identified all the relevance feature listing. Fourth, after we conduct the content analysis of the website, we also distributed the survey to confirm our result with various tourism business to ensure the validity of our findings. The population includes hotels and travel agents which have established their own

websites. Due to difficulty of obtaining full list of hotels and travel agents in Thailand, we assume that enterprises which register with the Association of Thai tourism Authorization and Thai Hotel Association are the population for this research. The two organizations hold 1,300 and 633 tourism members consecutively.

However, some tourism enterprises are members of both associations. After eliminating redundancies, 1,140 enterprises are remained. As a result, we decided to survey all 1,140 websites. In terms of survey questionnaire, the conceptual framework proposed in section 2 is used as a template. We developed questionnaire items for the four level of e-business progression investigating some successful, multi-national hotels and travel agents' websites, for example Hilton and Sheraton for hotel business and Expedia.com for travel agent business. Then, we conducted in-depth interviews with experts in both online and traditional tourism businesses.

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The interviews were very helpful in revising the questionnaire items to be more practical and complete.

To increase validity, a training session was set up for all research assistants. It was to explain to them in detailed on what to look for and which items in websites count as which items in the questionnaire survey.

FINDINGS

Of 1,140 tourism websites, 129 websites (11.32%) were found inaccessible and excluded from the survey. The rest 1,011 websites can be normally accessed. They composed 602 hotels (59.5%) and 409 travel agents (40.5%). Table III shows percentages of websites which appear to have certain items or features classified in each progression level and industry.

Table III: Website features of e-business tourism progression classified by hotels and travel agents

Web items/ features	Hotels		Travel Agents		Pearson Chi-Square		
	N	%	N	%	Value	Df	Sig.
Stage 1: Online Presence							
1. Company Information (e.g. About us)	417	41.4	323	32.0	12.375	1	.000
2. Information in foreign language	578	57.3	342	33.9	46.084	1	.000
3. Tourist attraction information	209	20.7%	247	24.5%	63.855	1	.000
4. Transportation Information	428	42.4%	249	24.7%	11.761	1	.001
5. Map	526	52.0%	181	17.9%	213.357	1	.000
6. Service conditions	329	32.6%	198	19.6%	3.910	1	.054**
7. Privacy conditions	200	19.8%	97	9.6%	10.567	1	.001
8. Contact email	540	53.4%	367	36.3%	.000	1	1.00**
9. Telephone number	572	56.6%	393	38.9%	.644	1	.000**
10. Contact address	565	55.9%	360	35.6%	10.651	1	.000
11. Frequently Asked Questions (FAQ)	65	6.4%	68	6.7%	7.242	1	.008
12. Product pictures	535	52.9%	327	32.3%	15.418	1	.000
13. Tour package information	135	13.4%	279	27.6%	211.172	1	.000
14. Travel tips	96	9.5%	177	17.5%	92.281	1	.000
Stage 2: Interactive and emerging online communication							
15. Virtual tour	70	6.9%	17	1.7%	17.286	1	.000
16. Facebook	196	19.4%	66	6.5%	34.206	1	.000
17. Youtube	54	5.3%	23	2.3%	3.877	1	.053**
18. Twitter	102	10.1%	35	3.5%	14.559	1	.000
19. Online chat	65	6.4%	56	5.5%	1.937	1	.168**
20. Online feedback form	267	26.4%	182	18.0%	.002	1	1.00**
Stage 3: e-Transaction							
21. Online payment	292	28.9%	84	8.3%	81.546	1	.000
22. Online request form	295	29.2%	144	14.2%	18.866	1	.000
23. Foreign currency calculation	162	16.0%	53	5.2%	28.313	1	.000
24. Availability of payment options	107	10.6%	53	5.2%	4.240	1	.043
25. Member registration system	91	9.0%	102	10.1%	15.213	1	.000
26. Stored customers' information for future use	65	6.4%	21	2.1%	10.083	1	.001
27. Online mileage system	12	1.2%	4	0.4%	1.601	1	.305**
28. Check booking status online	75	7.4%	39	3.9%	2.080	1	.157**
29. Product search engine	79	7.8%	85	8.4%	10.513	1	.002
30. Checking availability online	264	26.1%	55	5.4%	104.257	1	.000
31. Offer last minute bookings	38	3.8%	10	1.0%	8.054	1	.004
32. Top deal program	75	7.4%	51	5.0%	.000	1	1.00**
Stage 4: E-tourism system integration							
33. Online instant confirmation booking	248	24.5%	54	5.3%	91.100	1	.000
34. Dynamic packaging	65	6.4%	71	7.0%	9.008	1	.003

Web items/ features	Hotels		Travel Agents		Pearson Chi-Square		
	N	%	N	%	Value	Df	Sig.
35. Integration with partners' or suppliers' databases	172	17.0%	159	15.7%	11.620	1	.001

Overall, hotels and travel agents' websites are quite similar. Only 8 items are found significantly different results as the followings:

- Privacy condition: 32.6% of the hotels provide this information on their website, while 19.6% of the travel agents provide this information on their website
- Contact email: 53.4% of the hotels provide contact email on their website, while 36.3% of the travel agents provide the information
- YouTube: 5.3% of the hotels use YouTube to promote their products, while only 2.3% of travel agents use YouTube
- Online chat: 6.4% of the hotels provide online chat service on their website, while 5.5% of the travel agents do so
- Online feedback form: 26.4% of the hotels have an online feedback form on their website, while only 18.0% of the hotels provide the form
- Online mileage (reward) system: 1.2% of the hotels implement an online reward system, while only 0.4% of the travel agents do so
- Check booking status online: 7.4% of the hotels enable their customers to check booking status online, while 3.9% of the travel agents implement such feature
- Top deal program: 7.4% of the hotels provide top deal information, while 5% of the travel agents provide such information

DISCUSSION AND CONCLUSION

Considering each progression levels, the survey result reveals that e-business adoption of most Thai tourism enterprises still remain in stage 1 or 2. Comparing between hotels and travel agents, it can also be seen that percentages of travel agents' websites which progress to stage 3 and 4 drop quite sharply.

At stage 1, almost all website provide basic information, namely contact address, email, product information and pictures. Information which have not been found much in surveyed websites are FAQ and travel tips.

At stage 2, interactive and emerging online communication, such as Facebook and Twitter, is found in a far less proportion compared to features/items in stage 1. Less than 50% of the hotels

and travel agents have provided online feedback form for customers to make any contact, request or complain. Less than 30% of the hotels and travel agents have utilized Facebook. The lowest utilized channel is YouTube; only 7.5% of the surveyed enterprises have used the channel.

At stage 3, an online request form is provided by 43.2% of the surveyed enterprises, while 37.2% of the surveyed enterprises also provide online payment option for their customers. The figures reveal a small proportion of enterprises which are ready for e-business. There are more hotels which have reached this stage than travel agents for almost every feature in this stage.

At stage 4, similar trend to that of stage 3 is revealed. There appeared to be more hotels than travel agents whose websites have reached stage 4, except only the dynamic packaging feature which is normally not a focus of hotels.

Overall, the result reveal that most Thai tourism enterprises which adopted e-business have not progressed further to stage 2, 3, and 4. Besides, basic important information, such as e-mail address and product pictures, which should have been provided, was surprisingly found in only 89.4% and 85% of the websites consecutively. This can be implied that the tourism enterprises have not paid full attention to details of their websites, nor do they perceive usefulness and importance of informative websites. This could impede the progression to further stages.

Moreover, the lower percentages of websites appeared to be in stage 3 and 4 points out that many websites are adopted as a product catalogue or online presence channel only. About 30 – 40% of the surveyed enterprises attempted to implement features which are classified as in stage 3 and 4. This reveals a lack of an understanding on the full potential of e-business by Thai tourism enterprises. However, given the fact that main tourism revenues in Thailand are from European, American, and Asian travelers, websites should be of greater help to Thai tourism enterprises in acquiring these customers. Therefore, government and other relevant organizations should play a more proactive role in encouraging and supporting the Thai tourism enterprises to progress to the e-transaction and e-tourism system integration stage. A failure to develop to such stages could turn travelers to book their trip to Thailand from large-sized multinational travel agents, such as Travelocity

and Expedia, and make it difficult for Thai travel agents.

Small percentages of enterprises, which used other social networking channels, highlight the need for more support on how to utilize and fully benefit from such media. Appropriate use of the social media has been proved useful by a large number of prior studies (e.g. [14] [15]). Moreover, as these media are free or relatively low cost, an understanding of how to use them well will be of great benefit to the tourism enterprises.

Future Research could study in-depth on the situation in which travel agents are becoming less and less important to hotels. As our survey result shows that hotels seem to be more advanced than travel agents, such situation could lead to disintermediation or the removal of intermediaries from the tourism value chain as hotels can outperform their intermediaries. This is a serious issue which could impact a large number of travel agents in Thailand. Besides, it is interesting to investigate if such situation holds true in other countries. This could help demonstrate a clearer picture of the tourism industry as a whole.

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ONLINE CONSUMERS' DECISION-MAKING STYLES ONTOLOGY INCORPORATING FACTOR ITEM WEIGHTS

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ABSTRACT

Most studies about online consumer behavior have not considered the weight of each item corresponding to its particular decision-making style. As a result, there are not any measures of online consumers' scores for each decision-making style. Research has found that online consumers have different decision-making styles when purchasing product items. Therefore, measuring online consumers' decision-making styles is vital as it can be used to find out suitable product items for these consumers. This paper measures the score of each decision-making style based on the factor score coefficients. Finally, the factor score coefficient ontology is developed and expanded into an online consumers' decision-making style ontology so that it can be utilized by different e-marketing applications that exploit online consumer behavior.

Keywords: Electronic-CSI, Consumers' Decision-Making Styles, Factor Score Coefficient, Inventory Item, Online Consumer

INTRODUCTION

Consumers' decision-making style is defined as mental orientation characterizing a consumer's approach to making choices [11]. One of the ways to characterize consumer styles is consumer characterization, focusing on cognitive and affective orientations related to consumer decision-making [10][12]. Consumer characterization is very promising as it deals with the mental orientation of consumers in making decisions [11]. The origin of the consumer characteristics approach is based on an exploratory study by Sproles [10] that identified 50 items related to mental orientation. Sproles and Kendall [11] reworked this inventory (50 items) to reduce them to 40 items under the title, Consumer Style Inventory (CSI). In the CSI, factor analysis identified eight mental characteristics of consumer decision-making. Since the reliability and validity of the CSI were established [11] using a sample of high school students from the United States only, there was a lot of criticism about whether the CSI and the empirical findings developed with U.S. data could also be valid in other countries. More recently, Durvasula, Lysonski and Andrews [1]

responded to the criticism by comparing the results obtained in New Zealand with those obtained in the U.S.A. [11].

In order to deal with the emergence of e-commerce activities, it is necessary to consider the online consumers' decision-making styles that can affect the willingness of online consumers to purchase products on the web.

Bruskin/Goldberg Research reports that 75% of online shoppers consider credit-card security a primary concern [4]. In addition, Hoffman, Novak and Peralta [3] state that consumers' online information privacy is the primary barrier to online shopping.

Self-service technologies offered by e-businesses can lead to factors that can cause positive or negative reactions to the online shopping service. Meuter et al. [6] found that subjects are most satisfied with technologies that can save time (30%), work reliably (21%), are easy to use (16%), meet a salient need (11%), and offer greater control and access (8%).

Therefore, the CSI model [11] should be modified in order to fit the E-commerce environment. However, there has not yet been significant research on the analysis of consumers' decision-making styles in the E-commerce environment until Sam and Chatwin [9] developed an Electronic-CSI (E-CSI) model which addresses online consumers' decision-making styles.

E-CSI Model

Based on the CSI model [11], the characteristics of consumers' decision-making styles in E-commerce environment should satisfy at least one of the following criteria:

1. Include only those characteristics that can affect the decision of selecting the suitable products or services directly.
2. Include characteristics that are directly related to an online shopping environment.

As a result, a list of 18 items of consumer decision-making styles in E-commerce environment is identified in Table 1.

Table 1: Items in E-CSI Model

<i>Factor 1 – High-Quality, become buying habit Conscious Consumer</i>
1. Getting very good quality is very important to me.
2. Once I find a product or brand I like, I stick with it.
<i>Factor 2 – Brand Conscious Consumer</i>
3. The well-known national brands are best for me.
4. The higher the price, the better its quality.
5. I prefer buying the best-selling brands.
<i>Factor 3 – Novelty-Fashion Conscious Consumer</i>
6. I usually have one or more products of the very newest style.
7. Fashionable, attractive styling is very important to me.
<i>Factor 4 – Price Conscious Consumer</i>
8. I buy as much as possible at sale price.
9. The lower price products are usually my choice.
10. I look carefully to find the best value for the money.
<i>Factor 5 – Product Portability Conscious Consumer</i>
11. When buying products, portability is very important to me.
12. The smaller the product size, the more I prefer.
<i>Factor 6 – Web Site Content Conscious Consumer</i>
13. When I go shopping online, security is very important.
14. It is very important for the web sites to offer communication channels to me for enquiry.
15. It is very important for the web sites to offer product searching service to me.
16. It is perfect if the web sites can offer me richness information about products.
<i>Factor 7 – Web Site Animation Conscious Consumer</i>
17. It will be annoying to get a lot of animated effects on the business web sites.
<i>Factor 8 – Web Site Interface Conscious Consumer</i>
18. Design layout of business web site is one of the important factors to make buying decisions.

Factor one. This factor measures high quality and becomes a conscious consumer characteristic. Items loading on this factor measure how important a consumer thinks quality is for the buying decision and it becomes a consumer habit for buying the same high-quality products.

Factor two. This factor identifies a brand conscious consumer characteristic, “brand conscious, price equals quality”. It measures consumers’ orientation toward buying the more expensive, well-known national brands.

Factor three. This factor measures a novelty-fashion conscious consumer characteristic. High scores on this characteristic indicate that a consumer prefers new product style to those old fashioned styles.

Factor four. This factor measures a price conscious characteristic. A consumer having a high score on this factor is sensitive to product price and prefers buying low price products.

Factor five. This factor measures the product portability conscious characteristic. Those consumers who prefer smaller size products so that

it is flexible for carrying around have a high score on this factor.

Factor six. This factor measures the web site content conscious characteristic. What do consumers think about the facilities, such as security, searching tools, communication tools, product information, offered by online shops? The answer can affect the score on this factor. A high score indicates that consumers care so much about the website facilities that it can affect the consumers' buying decision.

Factor seven. This factor measures the web site animation conscious characteristic. Some consumers don't like the animation effect on the business web site. The reasons include: (1) Confusions about the information displayed on screen, (2) Low data transmission speed on the Internet. Those consumers who don't like web animation effect will get a high score on this factor.

Factor eight. This factor measures the web site interface conscious characteristic. The design of the web site is important to some consumers. Is it better to offer graphics display instead of text display on sensitive information or information that is not easy to understand? The location of the web tools on the web site can also affect some consumers when they want to get some services from the web site. Consumers who have a high score mean that the web interface is sufficiently important that it can affect their buying decisions very much.

Based on the E-CSI model, the factor scores of consumers' decision-making styles are computed to analyze online consumer behavior. In order to

allow managers making better decisions, the online consumer behavior should be analyzed accurately.

The remainder of this paper is structured as follows. Section II discusses the computation of factor scores for E-CSI model. Section III describes the factor score coefficients represented in ontology, which is described as machine interpretable definitions of basic concepts in the domain and the relationships between them [7]. Section IV describes online consumers' decision-making styles ontology. Finally, conclusions are presented in Section V.

COMPUTATION OF FACTOR SCORE FOR E-CSI MODEL

The E-CSI model is applied to four industrial sectors to prove that the same inventory items contribute to particular decision-making styles when consumers purchase different types of products. However, the weight of each online consumer characteristic contributing to a particular decision-making style has not been considered. According to Grice and Harris [2], using regression weights, factor score coefficients, is the best strategy for computing factor scores. Tables 2 and 3 present the factor score coefficient matrices of the E-CSI model for apparel and I.T. item industries.

The weights of inventory items for the eight decision-making styles shown in Tables 2 and 3 are used to evaluate the factor scores of the online consumers' decision-making styles.

Table 2: Factor Score coefficient matrix for apparel industry

	Component (Factor)							
	1	2	3	4	5	6	7	8
Prod1_Ans1	.028	-.113	-.162	.222	-.021	.204	-.106	.105
Prod1_ans2	.059	.376	-.013	.057	-.092	-.070	-.167	-.004
Prod1_ans3	.012	.492	-.044	-.294	.053	.108	.183	.106
Prod1_ans4	.049	.390	-.001	.017	.066	-.079	-.107	-.146
Prod1_ans5	-.081	-.094	.158	.543	-.087	-.166	-.086	.061
Prod1_ans6	-.024	-.014	-.082	.409	.126	.072	.124	-.047
Prod1_ans7	-.070	-.019	-.068	.084	.577	.152	.066	-.007
Prod1_ans8	.019	.063	-.010	-.116	.535	-.135	.102	.169
Prod1_ans9	.173	-.043	.162	.074	.177	.022	-.266	-.278
Prod1_ans10	-.048	-.057	-.039	.090	.027	.553	.178	-.121
Prod1_ans11	.016	-.068	.486	.073	.034	-.049	.041	.080
Prod1_ans12	-.071	.004	.474	-.009	-.104	.044	.069	-.012

Prod1_ans13	-.094	-.033	.027	.025	.065	-.031	-.038	.835
Prod1_ans14	-.012	.066	.092	-.230	.009	.545	-.172	.084
Prod1_ans15	.054	-.045	.075	-.002	.084	.019	.765	-.078
Prod1_ans16	.301	.098	.071	-.094	-.028	-.148	.077	.226
Prod1_ans17	.405	.048	-.073	-.107	.021	.042	-.090	-.081
Prod1_ans18	.403	.008	-.011	.004	-.035	-.019	.109	-.244

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

Table 3: Factor Score coefficient matrix for I.T. item industry

	Component (Factor)							
	1	2	3	4	5	6	7	8
Prod2_ans1	.044	-.066	-.066	.556	.148	.013	-.094	.037
Prod2_ans2	-.009	.313	.038	.277	.091	-.104	-.208	-.178
Prod2_ans3	.025	.448	.034	-.196	.033	-.188	.004	.217
Prod2_ans4	.034	.430	-.091	-.066	-.099	.052	-.050	-.152
Prod2_ans5	.011	.022	.510	.050	-.010	-.077	-.056	-.086
Prod2_ans6	-.040	-.070	.570	-.087	-.055	-.020	.020	.041
Prod2_ans7	.052	.071	-.016	-.007	.533	-.152	-.104	.035
Prod2_ans8	.090	.039	-.104	-.367	.306	.070	-.053	-.030
Prod2_ans9	-.073	-.176	.008	.250	.490	.141	.143	.035
Prod2_ans10	-.097	.130	-.067	.222	.072	-.151	.206	.441
Prod2_ans11	-.013	-.106	-.008	-.052	.015	.649	-.028	.031
Prod2_ans12	.003	.106	.009	-.043	-.154	.355	.197	.007
Prod2_ans13	.171	.051	.238	-.193	-.117	-.332	.371	.011
Prod2_ans14	-.087	-.091	-.091	-.036	.010	.117	.700	-.100
Prod2_ans15	.017	-.079	-.021	.003	.029	.097	-.151	.713
Prod2_ans16	.349	.025	-.006	-.008	.103	-.112	-.074	.029
Prod2_ans17	.354	-.017	-.045	-.010	-.006	.022	-.022	-.089
Prod2_ans18	.367	.046	-.057	-.055	-.023	.123	-.177	.016

Based on the coefficient matrices in Tables 2 and 3, the following facts can be deduced:

1. For a particular industry, different decision-making styles have different weights for the same inventory items.
2. For the same online consumers' decision-making style, there are different weights for the inventory items in different industries.

Having considered the two facts above, the factor-scoring formula for factor 1 in the apparel industry is shown in Equation 1.

$$Factor_Score_{(app,1)} = \sum_{j=1}^n Weight_{(app,1,j)} * Item_Score_{(j)} \quad (1)$$

where $Weight_{(app, 1, j)}$ is the weight of the j^{th} inventory item with respect to factor 1 in the apparel industry and $Item_Score_{(j)}$ is the score point of the j^{th} inventory item. Similarly, the factor-scoring formula for factor 1 in the I.T. item industry is shown in Equation 2.

$$Factor_Score_{(IT,1)} = \sum_{j=1}^n Weight_{(IT,1,j)} * Item_Score_{(j)} \quad (2)$$

FACTOR SCORE COEFFICIENTS REPRESENTED IN ONTOLOGY

The weights of inventory items are very useful since they can be used to determine the factor scores of online consumers' decision-making styles for different industries. In this research, the factor score coefficient ontology of online consumers' decision-making styles is developed using Protégé [8] and then it is expanded into the ontology of the online consumers' decision-making styles.

The factor score coefficient ontology of online consumers' decision-making styles should be designed in such a way that can satisfy the two facts deduced in Section II. First of all, the Factor_Weight class, which stores the item weights of a general decision-making style for different industries, is created and it is the superclass of the eight classes [7] indicating the item weights of the eight specific decision-making styles as shown in Figure 1, which illustrates the concept that the weights of inventory items are different for different online consumers' decision-making styles.

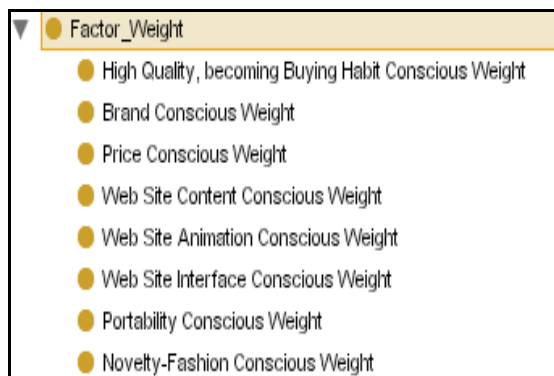


Figure 1: Eight classes representing the item weights of different decision-making styles

In order to consider item weights in different industries, there is an Items_Weight class, which stores the eighteen item weights in the E-CSI model as slots. Since Items_Weight class is also the superclass of the four industry weight classes as shown in Figure 2, the four industry weight classes inherit from Items_Weight class, indicating the weights of all 18 items for the four industrial sectors.



Figure 2: Four industry item weight sub-classes

In the Factor_Weight class, four slots can be created, each of which indicates the weights of all 18 items in a particular industry as shown in Figure 3 and Figure 4. Since the four slots are object instances of the four industry weight classes, as shown in Figure 3, the Factor_Weight class is a composite class. As indicated by filled diamond shapes in Figure 3, there is exactly one instance for each of the four slots in Factor_Weight class. It illustrates that there is exactly one set of item weights for each industry. Based on Figure 1, the eight factor weight classes inherit from Factor_Weight class to illustrate that individual factor weights are different for the four industries.

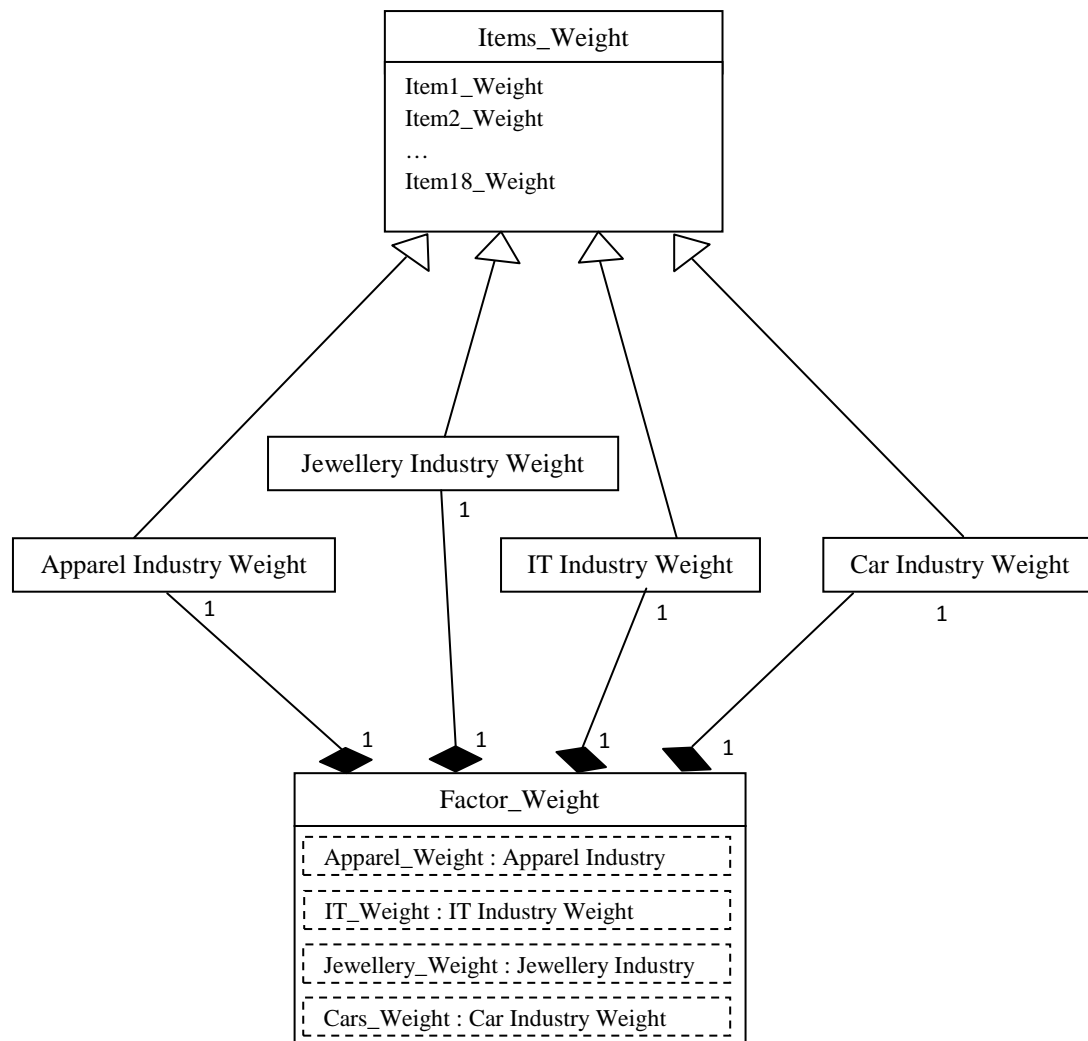


Figure 3: Class diagram showing Generalization between Items_Weight class and industry weight classes (at top) and Composition between Factor_Weight class and industry weight classes (at bottom)

CLASS EDITOR

For Class: ● Factor_Weight (instance of :STANDARD-CLASS)

Name: Documentation:

Role: Concrete ●

Template Slots

Name	Cardinality	Type
■ Apparel_Weight	single	Instance of Apparel Industry Weight
■ Cars_Weight	single	Instance of Cars Industry Weight
■ IT_Weight	single	Instance of IT Industry Weight
■ Jewellery_Weight	single	Instance of Jewellery Industry Weight

Figure 4: Slots in Factor_Weight class

ONLINE CONSUMERS' DECISION-MAKING STYLES ONTOLOGY

Since a person has different decision-making styles, all instances of the person class have different decision-making styles, such as price factor, etc. The Price Conscious factor class contains slots such as Price_Q1, Price_Q2, Price_Q3 (corresponding to three questions in price conscious factor), and Factor_Average (industry average score of the corresponding factor), as shown in Figure 5. The solid rectangles in Figure 5 represent classes and the dotted rectangles indicate instances. Arrows represent slots and instance of (io). Dotted lines indicate instances of other decision-making styles and their corresponding questions, not shown in the figure.

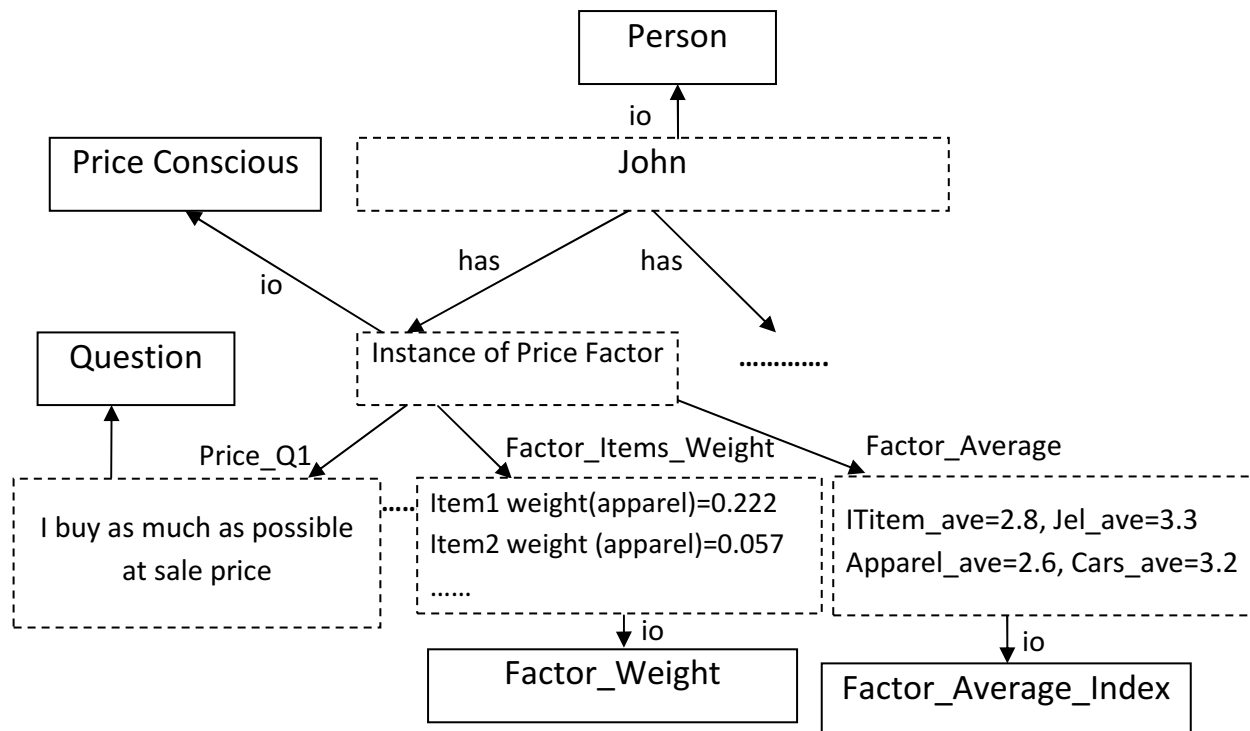


Figure 5: Relationship among classes in the domain of consumers' decision-making styles

The online consumers' decision-making styles ontology contains different classes for different decision-making styles. In Figure 6, there is a class for each decision-making style, which is important in describing the concepts of this model so that it is easier to access each decision-making style. Dec_Making_Style is an abstract class of the individual decision-making styles subclasses which indicates that a decision-making style is divided into eight categories. Each decision-making style class contains the following information:

- i. The related inventory items
- ii. The factor industry average values in different product industries obtained from the group means, each of which is calculated by averaging the raw scores on the highest loading item of each factor in a particular product industry [9].
- iii. The weights of inventory items
- iv. The factor score of the decision-making style

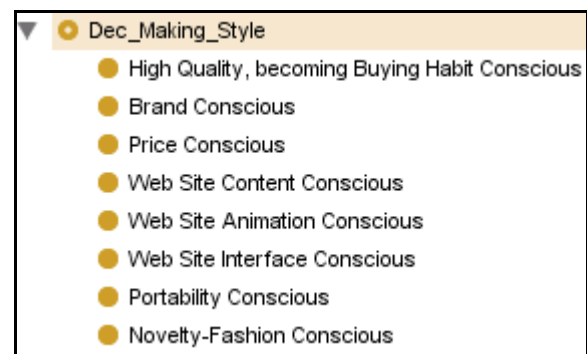


Figure 6: Hierarchical Structure of Decision-Making Style class

The weights of inventory items are indicated by the factor score coefficients which are incorporated into the online consumers' decision-making style ontology so that the factor scores of each online consumer's decision-making style can be easily evaluated based on the ontology. It can be achieved by including the weights of the inventory items for different industries in each decision-making style class as shown in Figure 7.

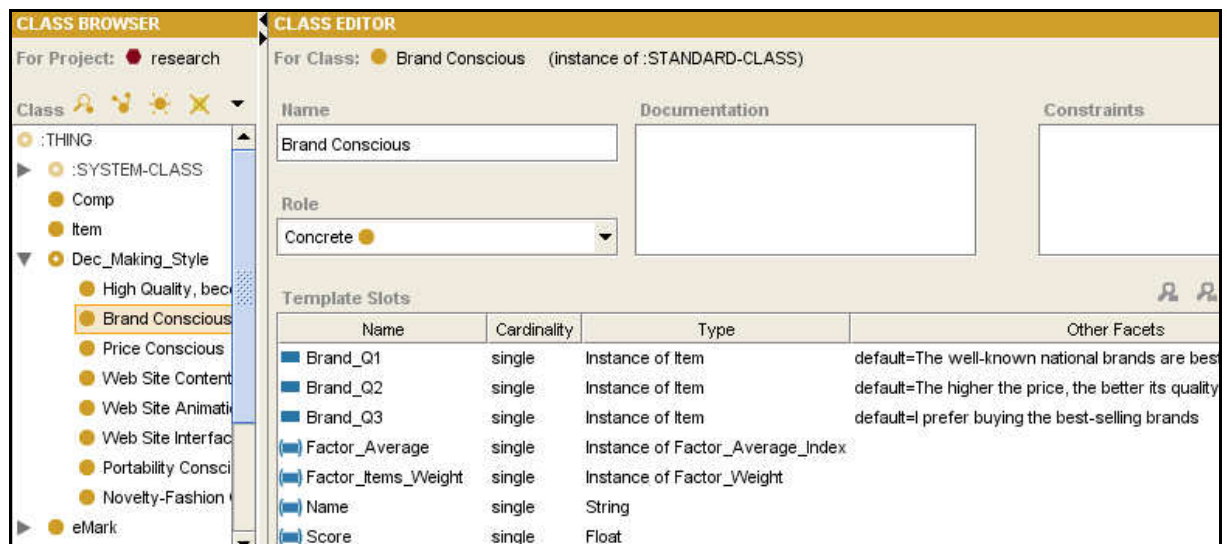


Figure 7: Slots in Brand Conscious factor of online consumers

The class Factor_Average_Index, shown in Figure 8, contains average indexes for different product industries as slots – Apparel, IT Item, Cars and Jewellery. Figure 9 shows the Person class which describes a person with his/her own decision-making styles.

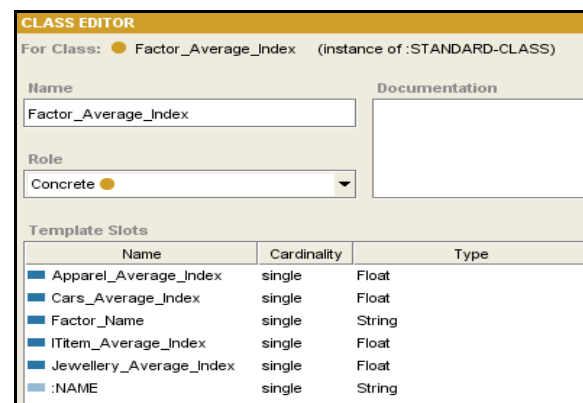


Figure 8: Attributes for factor average index class

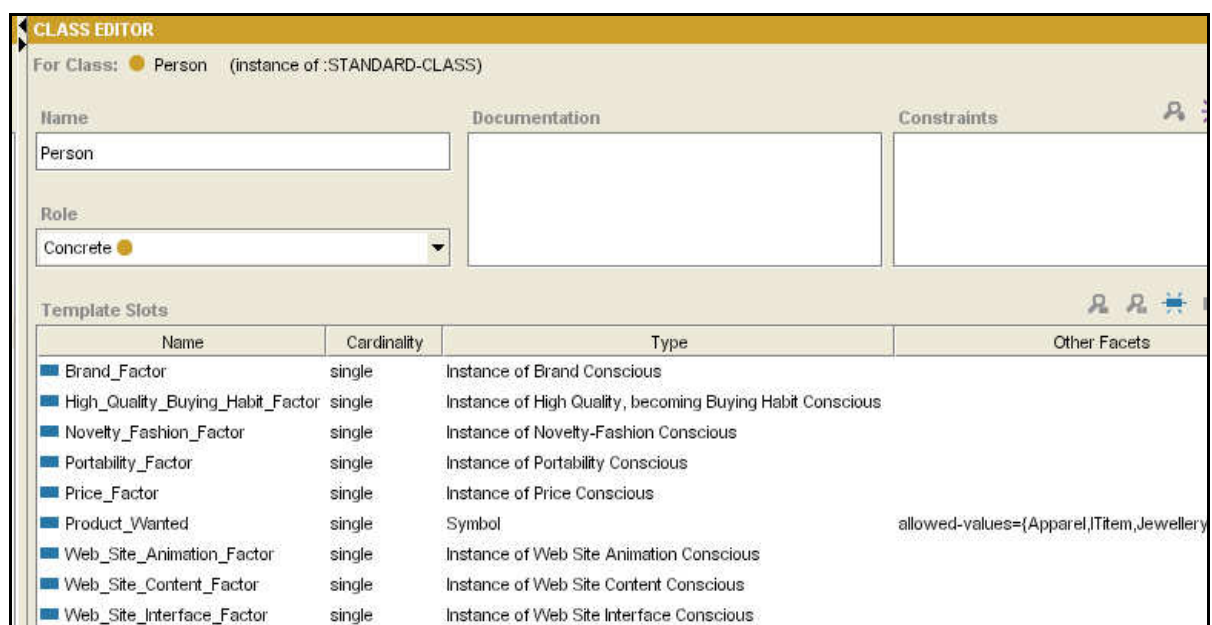


Figure 9: A Person class: Each consumer has its own decision-making styles

Knowledge Base

The weights of inventory items for different decision-making styles and the each decision-making style's industry average values are important for Internet consumer behavior

applications so that they should be stored in the ontology. Figure 10 shows the weights of some inventory items for the Brand Consciousness factor in the apparel industry while Figure 11 shows the factor industry average values of Brand Consciousness factor.

Instance ID	Weight	Item Name
research_Instance_6 (instance of Item1)	-0.113	Getting very good quality is very important to me
research_Instance_7 (instance of Item2)	0.376	Once I find a product or brand I like, I stick with it
research_Instance_8 (instance of Item3)	0.492	The well-known national brands are best for me.
research_Instance_9 (instance of Item4)	0.39	The higher the price, the better its quality
research_Instance_10 (instance of Item5)	-0.094	I prefer buying the best-selling brands
research_Instance_11 (instance of Item6)	-0.014	I usually have one or more products of the very newest style

Figure 10: Instance of Brand Conscious Weight in apparel industry

Factor Name	Apparel Average Index	Cars Average Index
Brand	3.3	2.7

Name	ITitem Average Index	Jewellery Average Index
Brand	2.7	3.4

Figure 11: Instance of factor industry average values of Brand Consciousness factor

CONCLUSION

In this paper, based on the factor score coefficient matrices, the weights of inventory items corresponding to their decision-making styles for the E-CSI model have been determined across the four non-consumable product industries; namely: apparel, IT item, jewellery and car items. The weights of inventory items play a very important role in the factor scores of the online consumers' decision-making styles, which are very important for e-marketing applications development related to Internet consumer behavior. Therefore, the weights of inventory items are incorporated into the online consumers' decision-making styles ontology. A sizeable and still-growing fraction of all software has been deployed on intranets or the Internet [5]. The ontology can be adopted by different intranet-based or Internet-based e-marketing applications to analyze online consumer behavior accurately.

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CUBE ASSESSMENT FRAMEWORK FOR B2C WEBSITES APPLIED TO THE FASHION INDUSTRY

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ABSTRACT

The paper proposes a framework for assessment and design of B2C websites focussing on Web 2.0 and social media as vehicles for involvement of current and potential customers. Three overall strategic dimensions are proposed for characterization of websites, whether the 1) purpose is branding or e-commerce, 2) communication is one-way or two-way, 3) focus is transaction or innovation. When these three strategic binary dimensions are combined, we get $2 \times 2 \times 2$ or a total of 8 different triplet combinations. The framework is used for an assessment of 15 fashion websites in the years 2006, 2008 and 2010.

Keywords: Web-site assessment, Web 2.0, social media, fashion, luxury

1.0 INTRODUCTION

Since the appearance of Internet websites in the mid 90's, this channel has become a major outlet for e-commerce as well as branding/marketing to consumers. In the US, Internet sales is now accounting for 4.1% of retail sales in Q 2 2011[16] while the turnover in Internet-shops is exceeding 10% of the total retail trade in the most developed "e-economies" like the Nordic countries [5]. Furthermore, the Internet is now becoming the largest medium in terms of spending on advertising [5], and Internet presence is becoming centre stage in marketing and sales functions, since the layout, design and functionality of Internet websites is critical to the attainment of company branding and sales objectives.

Accordingly, researchers and web-site designers have struggled with developing different types of frameworks for assessing, comparing and designing websites. In a comprehensive review of website assessment frameworks between 1995 and 2006, Chiou et al. [3] identified no less than 83 articles, and classified these into whether they had applied an IS approach, a marketing approach or a combined approach. We strongly believe that it is necessary to apply a combined approach, integrating the vendor (brand) as well as the consumer perspective. This is in accordance with the main trend identified by Chiou et al. [3], who found that while a combined approach in the period 1995 – 2001 was only applied in 27% of the studies, this figure had increased to 55% in the period 2001 – 2006, and we suspect that this figure would have grown since.

In another attempt at providing a consolidated view of categories studied in web-assessment studies, Park & Greetzel [8] classified all categories into 12 so-called "unifying" categories listed in order of frequency of use in the studies investigated by Chiou et al. [3]: Ease-of-use,

responsiveness, fulfilment, security/privacy, personalization, visual appearance, information quality, trust, interactivity, advertising/persuasion, playfulness and technology integration. This is a very useful overview of the abstract concepts having been applied in assessment of websites. However, since our purpose is to develop a framework based on directly observable "objective characteristics" (e.g. existence of feed-back, elements of augmented reality, or availability of e-shopping assistants), we decided to develop our own set of evaluation categories. The current study proposes a framework for creation and assessment of B2C websites especially taking into account interactive and social technologies.

The paper is organised in six sections. The background and strategic dimensions are introduced in the next section. This is followed by a presentation of the cube framework for assessing B2C websites with a detailed account of the assessment criteria categories. These are then applied in a longitudinal study of 15 luxury fashion websites in 2006, 2008 and 2010. The final section concludes the study and describes the implications and future research proposed.

2.0 STRATEGIC DECISIONS REGARDING WEBSITE DEVELOPMENT

The purpose and objectives of different websites obviously calls for different criteria of assessment as they are multidimensional in nature [6]. While CNN and Time Magazine aims at keeping the user for as long as possible, Google and airline portals like Momondo.com aims at providing a solution in the shortest possible time to enhance the ease of use. While some portals like Amazon.com aims at selling as much as possible, other sites like national TV and radio aims at entertaining and informing the users. Hence, even though the assessment framework might be the same, it is not obvious that having „more“ is better than having „less“. It all depends on the objectives of providing the web-site. We limit the further developments to commercial websites selling consumer goods. Furthermore, we believe that the framework is applicable to all products, we shall only attempt to illustrate its value to companies within the Fashion industry, an industry where marketing and branding is as important as actual sales.

Our framework consists of three strategic dimensions, which for the purpose of our analysis and development of the framework has been made binary. But in reality, it is possible to talk about several intermediary steps or even a continuum:

- Purpose (branding or sales)
- Mode of interaction (one-way or two-way)
- Orientation (operational or innovative)

The purpose of fashion websites is clearly always to support branding and other marketing activities, but it is very often supplemented with possibilities for shopping, including customization of products, dialog with the brand and possibilities for contributing with ideas or co-creating new products.

The second strategic dimension is whether the mode of interaction is purely one way as a mass marketing tool, or whether interaction is enabled. Two-way communication is becoming the norm rather than the exception in order for the website to have ecommerce, to open up for feed-back on the products available on the site, or even to enable crowd-sourcing of ideas or innovations.

The third strategic dimension is less than a binary choice than the other two dimensions. One the one hand we have the fairly standard websites allowing for different types of operational tools (e.g. displaying of product or company information and ordering of goods), while on the other hand we find innovative strategic use, closely linked to the overall strategic directions of the company.

If we combine the three strategic dimensions, we get 2^3 or eight different combined strategies, e.g. two-way, operational and sales, which we have chosen to label “commerce”, or one-way, innovative and branding, which we have chosen to label “context”.

This framework can be represented as a cube, where we have chosen to use the first strategic choice of whether of branding or sales as the most significant one. This is shown in figure 1.

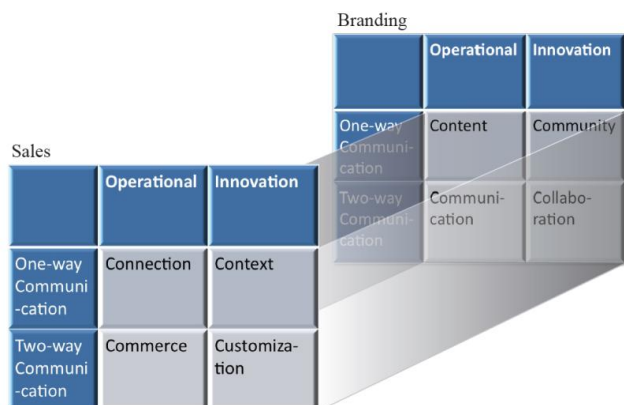


Figure 1 Cube framework for assessment of websites

3.0 WEBSITE ASSESSMENT FRAMEWORKS

Assessment of websites carried out during the last decade has been carried out from three different perspectives, the user (consumer) perspective, the designer (developer) perspective, and the owner (brand) perspective. While the user and designer perspectives are well represented in the literature, there is little research on developing websites and on-line business strategy from the brand perspective [6], as we are proposing to do here.

The starting point for our work has been Rayport & Jarworski's [10] 7C framework, which emphasises the specific role of website interface elements as a branding and sales channel between retailers and the customers. In other

words, the 7C's are the interface categories through which retailers communicate with their customers to deliver the core value proposition the company wants to convey. Yang *et al* [17] evaluated how the 7C framework [10] could be updated to include Web 2.0 applications and they extended the 7C framework with an 8th C, „Collaboration“, and created a reference model for evaluating and creating effective Web 2.0 applications. We have chosen to operationalize the 8C framework and developed specific sub categories or measurements for each of the categories, which might be observed from the websites. Furthermore, we have specifically chosen the brand perspective (instead of user or designer perspectives), and finally we have modified the framework for the assessment of luxury fashion websites.

An overview of the eight categories and sub-categories with a definition is provided in Table 2 in Appendix 1. Due to space limitations, we shall not discuss it in detail here, but proceed to apply the framework in a longitudinal investigation fashion websites through three surveys in 2006, 2008 and 2010.

4.0 ANALYSIS OF LUXURY FASHION WEBSITES

The observations of luxury fashion brand websites were conducted over a two week period in 2006 (of 25 brands), in 2008 (of 30 brands) and in 2010 (of 33 brands) by one of the authors. The last survey was further validated by a research assistant, who initially found a 12% inconsistency in the observation, mainly due to subjective interpretations of the websites and degree of user interaction possible on the site. All inconsistencies were explored, and the classifications were changed accordingly. In total 15 brands were included in all three observations: Burberry, Chanel, Chloé, Dior, Donna Karan, Gucci, Hermes, Louis Vuitton, Marc Jacobs, Mulberry, Paul Smith, Prada, Ralph Lauren, Valentino, and Versace. The reporting here will be the relative frequencies for each of the different 8C categories. Finally we shall identify especially relevant and potentially very effective types of categories by giving some „best-business practice“ examples.

Furthermore, 16 in-depth interviews were conducted to evoke attitudes and opinion of luxury brand professionals in order to collect information based on insider experience and privileged insights. In 2006 four interviews were conducted with brand managers (Burberry, Mulberry, Tanner Krolle, Jean Muir). In 2008 nine interviews included brand managers (Fabergé, MCM, Richemont), internet professionals (Limestone, FAST, Microsoft), and fashion website professionals (Skywire, Galle, Winkreative) were conducted face-to-face or over the telephone. In 2010 three interviews were conducted face-to-face with brand managers (Fabergé, Chanel, Boucheron).

Below follows our analysis of the developments over the three surveys for each of the 8 categories and sub-categories. The actual data are shown in three tables in Appendix 2. We shall provide specific examples of noteworthy developments for each Web 2.0 categories of the three years (2006, 2008 and 2010). Here we are only reporting on whether a certain sub-category is found in the three samples. A total for each sub-category provides an illustration of the direction of the adoption of the different sub-categories. In the discussion we

furthermore provide quotes from the interviews with luxury fashion brand managers to further illustrate the changes.

4.1 Branding

4.1.1 Content (Operational & One-way communication)

There has been a substantial development of the manner in which luxury fashion brands use product descriptions. In 2006 brands offered very sparse descriptions, sometimes even just product codes. This has changed into a more descriptive lifestyle text where products at best are described as a sales assistant greeting the customer entering a physical store; with feelings, atmosphere and a tone of voice which is characteristic to the brand. It is evident that brands with most developed descriptions (i.e. Burberry, Louis Vuitton, Mulberry and Smythson) have a higher online turnover.

Traditionally luxury fashion brands focus on their history and timeline and most brands had a section on their website dedicated to history in 2006 and 2008. However in 2010, history did not necessarily have a separate section on the website any longer, it was integrated in the overall communication. On the other hand, few brands offered corporate info in 2006 (33%), whereas it was increasingly offered in 2008 (40%) and 2010 (47%).

4.1.2 Communication (Operational & Two-way communication)

All observed brands except Versace from offered the option of signing up for newsletters, which is an important way of direct communication, which counts for around 10% of traffic generation [4]. Another sub-category, which has changed significantly over the four year period, was the prominent placement of the “email register”. In 2010 the important sign-up button was placed in the menu bar, meaning it was clearly visible on all individual sites. Contrastingly, brands are not placing great effort in being transparent by sharing “about us” and contact details. In 2006 nearly three quarters (73%) of the observed brands shared contact details in the form of phone number, email or postal address. In 2010 less than half (47%) of brands shared “about us” and contact details. Especially brands that didn’t offer ecommerce, like Chanel and Fendi, didn’t offer any contact details at all.

In 2008 half the brands (53%) used videos as a communication tool showcasing interviews with designers, craftsmen or celebrity ambassadors. Bally, Bottega Veneta, Donna Karan, Paul Smith, Tods, and Victor & Rolf had video interviews or messages from their designers. Ralph Lauren had interviews with celebrities telling about their favourite moments with the brand. Despite video content being hailed as the most important and compelling content in fashion [7][15], the observation in 2010 indicated that fewer brands (40%) are utilising video interviews on their websites.

Martin Mason, CEO at MCM, explained that through video interviews users can get a unique feel for the brand and be invited into the world of the brand. *“Videos give a different experience to reading; you are living in the visual experience and you are being entertained, i.e. seeing the way the designer moves, talks and what her personality is like. This is*

something that cannot be explained in words and something that is exclusive to the website and helps bring it to life”.

4.1.3 Community (Innovation & One-way communication)

This is the category where there has been the greatest development within the last four years. In 2006 and 2008 there were no own branded community sites, but by 2010 Burberry had launched “Art of the Trench” (in Nov 2009). Gucci had launched “Eye Web” in 2009 and “Gucci Connect” in 2010. Hermes had launched “Jaimemoncarre” (“I love my scarf”) in 2010 and brands like Mulberry, Paul Smith and Smythson had launched blogs where readers could comment and interact with the brand. Contrary to this, Ralph Lauren, Louis Vuitton, Jimmy Choo, Dunhill, Donna Karan, Dolce Gabbana and Chanel had launched blogs and news channels without the possibility of commenting – which is inherently contradicting the whole idea of blogs, and it illustrates the dilemma of brands opening up for a potential lack of control of their brand.

Likewise, there has been a strong development in the way in which luxury fashion brands adopted social media platforms like Facebook, Twitter and YouTube. In 2006 none of these platforms were generally used. In 2008 all the observed brands had videos on YouTube, though not yet through branded YouTube channels and most brands (90%) had a Facebook account. However these external sites were not managed and utilised very well. Most brands only had a logo as profile picture and nothing else developed in terms of content, pictures and features. Hermes did not even control their own Facebook profile, as there were 280 individuals pretending to be Hermes. Brands like Donna Karan and Mulberry had only around 1000 fans; Calvin Klein, Ralph Lauren and Dolce Gabbana had around 100.000 Facebook fans, while brands like Burberry had managed to grow its direct fan base into 3,5million fans in 2010.

All but two fashion brands (MiuMiu and Victor & Rolf), had a Facebook profile, and nearly three quarters had a Twitter profile. Around half of the brands posted something on their community site every day and around one quarter posted something weekly. Contrastingly, Alexander McQueen, Prada, Tods and Valentino had not taken control of or utilised their external community site, leaving the profiles in the hand of spammers.

4.1.4 Collaboration (Innovation & Two-way communication)

In 2006 and 2008 the luxury fashion brand websites had no categories of collaboration, whether related to design collaboration, co-creation nor feedback and comments regarding product development. In 2010 Smythson and Ralph Lauren involved their customers in designing products on their site. At Ralph Lauren customers could design their own Polo shirt (shape, colour, initials, badges etc.), and at Smythson customers could design their own stationary paper and have their initials or text engraved in the leather stationary items.

Fendi, Gucci and Marc Jacobs had a function on their

websites where visitors could “like” the individual products, which consequently gathered a pool of “likes” and helped other visitors see which products were most popular amongst fellow visitors.

In 2010 the observation of the category *collaboration* was extended to Facebook and Twitter i.e. observing how brands open up for feedback, comments and collaboration on Facebook. All brands with a Facebook profile had posted something on their wall, but only one brand, Smythson, replied to customer comments on its own posts on Facebook and Twitter. Burberry’s Creative Director, Christopher Bailey, posted a video once a month greeting Burberry’s Facebook fans, where he replied to some of the comments, and told the fans how much they meant to Burberry. Similarly, Marc Jacobs’s CEO, Robert Duffy, took over the brand’s tweets for a month leading up to their fashion show in the autumn 2010. He tweeted some very personal messages about the business, Marc and himself, and he posted pictures of the seamstresses, designers, cutters and models, while answering all the tweets he got from followers. Marc Jacobs’ Twitter profile grew from a few thousands followers to 75.000 followers in that period of time.

Julie, Internet Retail Development Manager at Chanel, however, still had concerns about interacting with fans and allowing their unfiltered feedback: *“It’s really difficult to control your brand in the social media. Brands are afraid of what people say and how they interact with the brand. You can only really control the brand on your own website”*.

4.2 Sales

4.2.1 Connection (Operational & One-way communication)

In 2010, brands were to a large extent linking traffic from their own site to their own social media platforms, increasingly integrating the brand platforms online. They were also increasingly taking control of their own online sales channel online instead of linking to third party selling sites like eluxury, Net a Porter, and Neiman Marcus as they did in 2006.

The phenomenon of syndication (i.e. placing branded content or products from own site on other sites) had not emerged in the fashion industry in 2006, but in 2008 the majority (87%) of brands used syndication. However in 2010 everybody had it. The most widespread use was achieved by Gucci, Chanel and Burberry, who also are also the more active on social media platforms and have many Facebook Likers – meaning many people and stakeholders spread the word of the brand and acted as online brand ambassadors.

4.2.2 Commerce (Operational & Two-way communication)

In 2006 a quarter of the brands observed offered ecommerce in the UK and half of the brands offered ecommerce in the US, though the majority only offered a small selection of accessories (only Paul Smith offered a selection of clothes as well). In 2008 more than half (60%) of the observed brands offered ecommerce on US commerce sites. Burberry,

Hermes, Paul Smith and Mulberry were amongst the few brands that offered ecommerce to multiple countries. However in 2010 there was a significant difference; more than three quarters (80%) of the observed brands offered ecommerce to US, UK and most of EU. The majority of brands offered both accessories and clothes, except from Dior, Louis Vuitton and Prada who offered accessories only.

There were no virtual flagship stores with immersive and engaging lifelike shopping, as in gaming environments. Cartier had a navigational virtual store with a shopping assistant showcasing and explaining the products in 2008, and Victor & Rolf had a navigational tour of the house, shows, library etc. However, none of these offered the option to actually buy the products on display. In 2010 Gucci launched a “digital flagship store” [9], and Marc Jacobs launched a “virtual store”, where the visitors were welcomed by a guy (a drawing), opening the door, and different shopping assistants (drawings) at each product station.

No brands offered a 24/7 real-time shopping assistant either in the form of online chat or video conferencing, as for example luxury jewellery brand Fabergé does. A third of the brands (33%) in 2008 claimed to have shopping assistance via phone, email or a fill-in form. In 2010 the majority (80%) claimed to have shopping assistance available, however when testing Gucci’s contact form, it took more than two weeks to get a reply to a product question. It is worth noting that following completing the observation, Burberry did launch online 24/7 real-time chat and call function to their site in January 2011.

Mark Dunhill, CEO at Faberge, talked strongly about bringing the human touch to the online platform, *“The online experience and service needs to be as special as in the physical store. Sales advisors can help retain the emotional and otherworldly experience of the brand and the product...Technology provides the opportunity to entertain and connect with your customer”*.

Ralph Lauren offered a shoppable video “RL Gang”, an immersive storytelling video of kids going to school, where the viewer could click on the clothes in the video and be directed to the chosen product’s URL where it could be purchased.

Many retailers like Barneys, Next and online fashion shops like ASOS have launched social commerce or Facebook commerce i.e. selling their collections directly through their Facebook page. However, only one of the brands observed, Louis Vuitton, offered this function on their Facebook page with completion of sale on their own website. Nevertheless, a third of the observed brands utilised social shopping in a related manner; they added a “share button” next to products on their website enabling the visitor to share the product on his/her social media profiles.

4.2.3 Context (Innovation & One-way communication)

There was a significant change in the use of Flash on luxury brand’s websites. In 2006, nearly three quarters (73%) of the observed brands used Flash, in 2008 all brands (100%) used flash, but in 2010 some brands had steered away from flash

again. Flash was traditionally used because of its lively and interactive qualities, but Flash is not viewable on iPhones and iPads and prohibits the viewer from accessing the sites on these increasingly popular and important devices [15].

Only half of the observed brands used video features (fashion shows, brand or campaign videos) on their websites in 2006, whereas the majority of brands did in 2008 and 2010 (80%). The videos are all very stylised and controlled. They are inherently without video posts, blogs or interactive videos, where the brand can talk directly to fans and customers as exemplified on social media platforms (i.e. Burberry's video posts to Likers on Facebook). Burberry furthermore utilised an interactive 3D video on its site where the user could drag the models and products in all directions on screen creating a very engaging and entertaining interaction.

Recently automobile and jewellery luxury brands like BMW, Faberge, Tissot, and Boucheron have adopted augmented reality technologies in order to give the shopper the possibility of trying on products, achieving a more real-live feel, and making the product come to live on the screen. This adoption of technology has however not reached the luxury fashion brands yet. Berta de Pablos, Global Director of Marketing & Communications at Boucheron, talked about her experience with augmented reality, saying, *"You have to start with the brand, not the technology. You have to ask, how can we create the dream of the brand in the minds of the consumers? ...The Internet can be a catalyst of emotions. We experienced that people were intimidated going into our stores, but we wanted them to interact and connect with the brand. Augmented reality allowed for this."*

Photo technology like 3D scanning of products, which enables the visitor to turn the product around, as if she had it in her own hand, is now increasingly popular on ecommerce stores. Brands like Nike and Apple, as well as online fashion stores like ASOS and Net a Porter use this technology as it enhances the buying experience and hence conversion rate significantly [12] (Sabouri and Jaladi, 2009). However none of the observed luxury fashion brands utilised the 3D technology or 360 degree views in 2010.

4.2.4 Customization (Innovation & Two-way communication)

Product customisation and personalisation were the origin of luxury products; it was all about the individual and intimate relationship with the designer, craftsman and the customer. The Internet offers the opportunity of connecting with the individual customer in this unique and intimate manner again. There are, however, very few luxury brands which make use of this opportunity. In 2008 only Smythson and Ralph Lauren offered customisation (where the customer is involved in the design of the product) and personalisation (where the customer can add their initials or personal mark). In 2010, Louis Vuitton also offered customisation on their website and on their Facebook profile.

The technology which recognises the user is widely used by ecommerce sites like Amazon (books and consumer goods), Tesco (groceries), New Look and H&M (high street fashion), for offering a personal experience on the website, but luxury

fashion brands are generally not first movers. In 2006 no brands offered a "sign in" feature. In 2008 a few of the observed brands offered the feature, and it was not until 2010 where more than half (60%) of brands offered a "sign up" feature enabling the brands to recognise the visitors who logged in

5.0 LONGITUDINAL ANALYSIS OF FASHION BRANDS' ONLINE STRATEGIC CHOICES

The development in functionalities of the fashion websites over the three surveys is visualized in table 3 below. In this table we have chosen only to show the extent to which fashion brands have adopted „Sales“, „Innovation“ and „Two-way communication with customers/users“. In all of these three, there is a very clear development.

Overall, the three surveys clearly show that more brands have extended their traditional often rather low key branding to include sales, their traditional on-way mass marketing to include two-way communication, and have ventured into innovation over the period. In this way, fashion brands are closing the previous gap of what customers expect from brands, and what their websites that can offer regarding social interaction, two-way communication and a personalized relationship with the brand [14][11][13].

Table 1. Comparison of strategic website usage in the years 2006, 2008 and 2010.

	B2C Website Assessment Framework								
	Sales			Innovation			Two-way		
	2006	2008	2010	2006	2008	2010	2006	2008	2010
	S	S	S	I	I	I	T	T	T
Burberry	x	x	x			x			x
Chanel									
Chloé									
Dior	x		x						x
Donna Karan			x						x
Gucci	x	x	x		x		x		x
Hermes	x	x	x			x			x
Louis Vuitton	x	x	x			x			x
Marc Jacobs			x			x			x
Mulberry	x	x	x			x			x
Paul Smith	x	x	x			x			x
Prada		x	x						
Ralph Lauren	x	x	x		x	x		x	x
Valentino		x	x						x
Versace									
Total	8	9	12	0	2	8	0	2	11

Within the three strategic dimensions „sales“, we found a substantial increase in the number of fashion brands moving to a *transactional* stage (actually providing a shop), provide an *e-shopping assistant* and provide digital tools like *shop able video* and *social commerce* in 2010. Actually, the category „Collaboration“ was not even utilised in 2006 and 2008, but has been adopted in 2010, although not on the brand websites, but on the brand controlled social media platforms. Here some brands have started to interact, share, collaborate and receive feedback from consumers. Regarding the subcategory *brand community* within „Community“ also show a significant increase in brands' creation of their own communities like Burberry's Art of the Trench.

The slowest development is associated with new technologies such as *augmented reality*, *3D*, (within the category „Content“) and *virtual stores* (within the category „Commerce“). No luxury fashion brands have adopted these technologies, though luxury jewellery brands have.

Interestingly, the expert interviews show an intention to adopt interactive and social Web 2.0 tools to a higher degree than what is already implemented. The interviewees expressed that there are great opportunities to be harvested in all categories, which eventually will enhance the overall website experience and ultimately support brand experience and sales. Christopher Bailey, Burberry's creative director, summed this up perfectly at a fashion show in September 2010 *“We are now just as much a media-content company as we are a design company, because it is part of the overall brand experience”* [1].

Lastly, we would argue that the lack of contact details and the lack of two-way interaction on websites and social media sites indicate that luxury fashion brands are still cautious and keen to continually control the images and messages they push out to their customers and fans. Interaction does not flow both ways; it is still predominantly a one-way communication, dictated by the brands that are afraid of what their customers and fans might say about them. This is in strong contrast to previous research findings on consumers wishes and wants [14][11], [13], and to how consumers in general are empowered by interactive and social media. Consumers expect to define their own perspective on companies and brands, thus shifting the balance of power from company to customer [2]. Henceforth, luxury fashion brands have to continuously work on creating dream value by providing exceptional experiences online with the help of digital technologies and by interacting with consumers [7].

6.0 CONCLUSION

Internet shopping is now exceeding more than 10% of retail trade in the most digitized economies, and marketing on the Internet (typically using Google AdWords) is now the largest advertising media having surpassed the advertising revenue of newspapers, magazines and TV-advertising. An industry like the Fashion industry must develop, implement and further innovate its Internet strategy.

We identified the three strategic choices for an Internet-strategy, purpose (branding or sales), mode of communication (one-way or two-way) and focus (branding and/or sales). When combined, these three dimensions created eight „triples“, which we found correspond to the 8C framework of Yang et.al [17]. We further operationalized the 8 categories by providing between 2 and 5 specific measurement sub-categories, which were applied to a longitudinal analysis of 15 fashion brand websites.

The survey shows the large increase in adoption of the strategic possibilities, but it also shows a large difference between the extent to which the individual brands have adopted the options. Probably more than most other industries, the fashion industry is very uncertain whether and how to apply the web-site opportunities, primarily because of the challenge of maintaining control of their brand, because

fashion brands are confronting the dilemma of maintaining the exclusivity while at the same time opening up for real two-way communication and involvement of its customers. Our Cube-framework with its operationalization has proved very valuable in identifying and differentiating between the strategies of the different brands within the fashion industry. We suspect that it will be valuable also beyond the fashion industry, but leave it to further research to demonstrate this.

APPENDIX

Table 2. The 8C framework applied to luxury fashion brand websites

Interface categories	Applied to Luxury Fashion Brand Website Assessment
Content <ul style="list-style-type: none"> • Branding • Operational • One-way 	Definition: <i>Enticing mix of product information and comprehensive brand information.</i> <ul style="list-style-type: none"> • Product information. Does the site offer detailed and engaging product descriptions or only sparse information? • History. Does the site offer a history section about the brand? • Corporate information. Does the site offer corporate information related to the brand? • Special promotions / campaigns. Does the site have special campaigns or sections functioning like a shop window which is changed seasonally?
Communication <ul style="list-style-type: none"> • Branding • Operational • One-way 	Definition: <i>News, details and communication about the brand including getting behind the scenes.</i> <ul style="list-style-type: none"> • Email register. Can the visitor sign up for newsletters on the site? • About us / Contact. Is there an “about us” section and contact details for the brand? • Video interviews. Does the site have video interviews with the designer, brand owner or perhaps fans of the brand?
Community <ul style="list-style-type: none"> • Branding • Innovation • Two-way 	Definition: <i>Communities established by the brand where connoisseurs and fans discuss the brand.</i> <ul style="list-style-type: none"> • Own brand community. Does the site have a community section launched and controlled by the brand itself? • Community on external site. Does the brand have communities on external social sites such as Facebook, YouTube and Twitter? And how many fans have joined this community?
Collaboration <ul style="list-style-type: none"> • Branding • Innovation • Two-way 	Definition: <i>Collaborating and opening up for comments and feedback from fans and customers.</i> <ul style="list-style-type: none"> • Design collaboration. Is it possible to collaborate with the brand on either the brand site or on Facebook? • Feedback & comments. Does the brand allow comments and does it interact with customers on brand site or on Facebook?
Connection <ul style="list-style-type: none"> • Sales • Operational • Two-way 	Definition: <i>Connection to other complementing sites.</i> <ul style="list-style-type: none"> • Links to other sites. Does the site have links to other sites and external sites? • Micro sites. Does the brand have sub-sites for i.e. campaigns or special collections? • Syndication. Does the brand have syndication of content (products, advertising etc) on other complementing sites? (in 2010 this was measured by Vitruv.com)
Commerce <ul style="list-style-type: none"> • Sales • Operational • Two-way 	Definition: <i>Shopping the brand's products on the website.</i> <ul style="list-style-type: none"> • Transactional. Does the site offer ecommerce? • Virtual store. Does the site have a virtual store which customers can walk through and purchase from? • Link to third party. Does the site have links to other sites which sell the brand's products? • e-shopping assistant. Does the site have a shopping assistant in the form of live chat, telephone line or live video advice? • Shoppable video. Does the site have videos where customers can shop from? (only in 2010) • Social commerce. Does the brand offer ecommerce on their social media platforms like Facebook or YouTube?
Context <ul style="list-style-type: none"> • Sales • Innovation • One-way 	Definition: <i>Importance of beautiful and aesthetically pleasing design.</i> <ul style="list-style-type: none"> • Flash. Does the site use immersive Flash graphics or e.g. HTML? • Videos. Does the site have videos of fashion shows, of products, or any brand related material? • Animations. Does the site use animations to convey the brand? • Augmented Reality. Does the site offer augmented reality features which either allow to try on the products or offer extra brand experience? (Only for 2010) • 3D. Does the site offer any 3D technology, enabling engaging interaction with products, campaigns or other features? • 360° view. Does the site offer 360° view of the products, creating a „live“ and tangible feeling of the products through visuals and product rotation?
Customization <ul style="list-style-type: none"> • Sales • Innovation • Two-way 	Definition: <i>Customising the site experience for the individual user.</i> <ul style="list-style-type: none"> • Product customisation. Does the site offer the possibility of customising products? • Personalisation. Does the site offer the possibility of personalising products i.e. adding initials to a product? • Recognition of user. Does the site recognise the users? E.g. is there a “sign in option?”

Table 3 B2C Website Assessment 2010

		B2C Website Assessment Framework																														
		Branding												Sales																		
		Operation one-way communication				Operation two-way communication				Innovation one-way communication				Innovation two-way communication				Operation one-way communication				Operation two-way communication				Innovation one-way communication				Innovation two-way communication		
2010	Content				Communication				Community				Collaboration				Connection				Commerce				Context				Customisation			
Brand	Product info	History	Corporate info	Special promotions/campaigns	Email Register	About us / contact	Video interviews	Brand community	Community external site	Design collaboration	Feedback/ comments	Links to other sites	Micro sites	Syndication	Virtual Store	Transactional	Link to 3rd party	e-shopping assistant	Shoppable video	Social Commerce	Flash	Videos	Animations	Augmented reality	3D	360° view	Product Customisation	Personalisation	Recognition of user			
Burberry	x	x	x	x	x	x	x	x	x		x			x							x	x	x						x			
Chanel	x	x				x			x				x	x								x	x	x								
Chloé	x	x				x						x										x	x									
Dior	x												x	x			x	x				x	x									
Donna Karan	x	x	x			x	x		x				x	x			x	x				x							x			
Gucci	x	x	x	x	x	x	x	x	x				x	x			x	x					x									
Hermes	x					x		x	x							x	x	x				x	x	x					x			
Louis Vuitton	x		x	x		x	x		x				x							x		x	x				x	x	x			
Marc Jacobs	x	x	x			x			x		x					x	x					x	x	x					x			
Mulberry	x	x	x	x		x	x		x				x	x	x		x	x				x	x						x			
Paul Smith	x	x		x			x		x				x	x	x		x	x				x							x			
Prada	x	x				x							x	x			x					x	x									
Ralph Lauren	x	x	x	x		x	x	x		x	x		x	x			x	x	x			x	x					x	x			
Valentino						x			x					x			x	x				x	x						x			
Versace			x	x	x				x				x	x																		
total	14	11	7	8	14	7	6	5	15	1	3	5	5	15	0	12	0	12	2	1	12	12	3	0	1	0	1	2	9			

Table 4 B2C Website Assessment 2008

2008	B2C Website Assessment Framework																								
	Branding										Sales														
	Operation one-way communication				Operation two-way communication			Innovation one-way communication			Innovation two-way communication		Operation one-way communication			Operation two-way communication		Innovation one-way communication		Innovation two-way communication					
	Content				Communication			Community			Collaboration		Connection			Commerce		Context		Customisation					
	Flash	Videos	Animations	360 view	Email Register	About us / contact	Video interviews	brand community	community external site	Design collaboration	Feedback/ comments	links to other sites	micro sites	Syndication	Virtual Store	Transactional	link to 3rd party	e-shopping assistant	Flash	Videos	Animations	360 view	Product Customisation	Personalisation	Recognition of user
Burberry	x	x			x	x			x					x		x			x	x					
Chanel	x	x			x	x	x		x											x	x				
Chloé	x	x			x								x	x			x		x	x					
Dior	x	x			x	x	x		x					x				x	x	x					
Donna Karan	x	x			x	x	x		x					x					x	x					
Gucci	x	x		x	x	x			x					x		x			x	x		x			
Hermes	x	x	x		x		x		x							x			x	x	x				
Louis Vuitton	x	x			x	x	x		x					x		x		x	x	x					
Marc Jacobs	x	x			x	x	x		x					x					x	x					
Mulberry	x				x	x			x					x	x				x						
Paul Smith	x	x			x	x	x		x					x		x			x	x					
Prada	x	x	x		x				x					x	x			x	x	x	x				
Ralph Lauren	x	x	x		x	x	x		x				x	x	x		x	x	x	x			x	x	x
Valentino	x				x	x			x					x		x		x	x						
Versace	x					x			x										x						
total	15	12	3	1	14	12	8	0	14	0	0	4	3	13	0	9	1	5	15	12	3	1	1	1	1

Table 5 B2C Website Assessment 2006

2006		B2C Website Assessment Framework																															
		Branding												Sales																			
		Operation one-way communication				Operation two-way communication				Innovation one-way communication				Innovation two-way communication				Operation one-way communication				Operation two-way communication				Innovation one-way communication				Innovation two-way communication			
		Content				Communication				Community				Collaboratio				Connection				Commerce				Context				Customisation			
		Product info	History	Corporate info	Special promotions/campaigns	Email Register	About us / contact	Video interviews	Brand community	Community external site			Design collaboration	Feedback/ comments	Links to other sites	Micro sites	Syndication	Virtual Store	Transactional	Link to 3rd party	e-shopping assistant	Flash	Videos	Animations	360° view	Product Customisation	Personalisation	Recognition of user					
Burberry	x	x	x		x	x												x				x	x										
Chanel			x		x																	x	x										
Chloé	x	x			x										x					x			x										
Dior	x	x	x			x	x												x				x	x									
Donna Karan			x		x	x	x								x					x			x										
Gucci	x		x		x	x	x												x		x		x										
Hermes	x	x			x	x													x				x		x								
Louis Vuitton	x	x			x	x													x				x	x									
Marc Jacobs	x	x				x																	x										
Mulberry	x	x			x	x													x				x										
Paul Smith	x	x			x	x													x				x										
Prada	x																		x				x										
Ralph Lauren	x	x	x		x	x													x				x	x									
Valentino			x												x					x			x	x									
Versace		x				x																	x	x									
total	11	12	5	n/a	11	11	0	0	0	0	0	0	3	n/a	n/a	0	8	3	1	11	7	1	0	0	0	0	0	0					

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HOW WELL DO MANAGERS KNOW AND USE EVALUATION METHODS FOR ASSESSING E-BUSINESS TRANSFORMATIONS?

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ABSTRACT

This paper investigates methods for assessing IT induced business transformations based on a quantitative empirical Austrian study. We show that decision makers are gaining more information about methods but are not equally applying their knowledge in practice. We observed a noticeable gap between levels of diffusion (known) and infusion (used) of evaluation methods. There remains a clear emphasis on tangible costs and benefits reflected by the highlighted knowledge and application of financial methods. Results would warrant renewed attention to the role of organisational change in evaluation practice and organisational learning in the context of analytical dynamic IT capacities.

Keywords: Decision Making Methods; e-Business Value; IT Evaluation; IT Justification; IT Projects

INTRODUCTION

Research has brought forward many different techniques, methods and procedures to assist a decision maker facing a complex decision scenario. This paper focuses on IT evaluation methods used to assess e-Business projects, which we broadly define as IT induced businesses transformations delivered by introducing an information system to support all or large parts of the business activities [11]. We focus on ex-ante evaluations during the proposal stage to support decision making and system justification which usually are connected with high levels of intangibility and subjectivity. Many of the IT evaluation problems identified by Irani [24] are prevalent today, exacerbated yet further by increasing IT expenditures [19] and associated risks [1, 30]. Contemporary views state that organisational managers as well as information systems (IS) professionals need to recognise IT evaluation as one of the important unresolved concerns in management [35]. Smithson and Serafeimidis [48] state that the existing literature has identified noticeable gaps between academic theories, commercially available methodologies and actual evaluation practice within organizations. Over the last decades we have seen a constant development of evaluation models and tools with the ultimate goal to increase decision making satisfaction in organisations. A research agenda for decision support systems consequently highlights the need for explicit efforts to apply analytic models and methods [46]. Consequently, within this paper we seek to present a current taxonomical account of decision making methods with the aim to report whether or not evaluation methods are known and also used. In other words we seek to explore the knowledge existing in organisations about methods (diffusion view) and the actual use of methods (infusion view). Infusion therefore is an expression for the depth of use and degree of usage of features provided [17], in this

case features provided by decision support methods or methodologies. There is a difference between passive knowledge, i.e. being aware of methods, and active knowledge, actually using methods in practice. We need to understand where we are with method related capacities in organisations in order to increase the effectiveness of decisions in practice. Depending on the current state we could then either continue to improve methods or maybe rather focus on learning, i.e. absorbing existing method knowhow into practice, which would be a matter for knowledge management in the context of organisational learning theories. To answer these questions we conducted an exploratory empirical survey in Austria based on dominant methodological perspectives from IS literature. Furthermore the paper defines and explains decision support methods as a general concept. This is done by a theoretical discussion of decision making taxonomies, considering the number of decision makers, decision criteria and decisions [50], the field of application [53], and taxonomies focusing on classifications into classes of approaches such as financial or multi-criteria [40, 41]. The next section presents a brief review of literature offering method illustrations and taxonomies supported by the Annexe with method descriptions. This is followed by a concise presentation of the research methodology and empirical results. Finally, a discussion of the findings and conclusions are presented.

THEORETICAL BACKGROUND

IT appraisal taxonomies and methods

Many different attempts have been made to develop theoretical taxonomies of methods used in IT appraisals, which essentially constitute different views on the wide field of supporting methods and frameworks. The classification of methods can be guided by the type of IT investment decision and time of decision [39], type of evaluation support [9, 40, 53], purpose of evaluation, breadth of impact and evaluation complexity [50], relevance to IT practice [32], and other characteristics.

To get an idea of complexity decision support methods can be divided along three criteria: the number of decision makers; the number of decision criteria; and the number of decisions needed. Other approaches can use the input or outcome of an evaluation process or the kind of support given to classify methods [9]. Many similar but in detail different taxonomies of this kind exist, such as a division of decision support methods into the following top-level classes: process models; choice models; information control techniques; analysis and reasoning aids; representational aids; and judgement refinement/amplification techniques. Every class was further divided into different sub-categories [53]. Another angle to view methods is their appropriateness to IT evaluation practice [32]. The shortcomings of traditional evaluation methods were criticised, which led to new adjusted traditional evaluation methods, new evaluation

techniques and mixed approaches deemed most needed to satisfy IT evaluation needs. Probably one of the most exhausting classifications presented methods as financial, the multi-criteria, ratio approach and portfolio approaches [40]. The financial category consists of traditional, quantitative approaches such as discounted cash flow calculations. Multi-criteria approaches cover methods that are based on pre-defined, but not only quantitative criteria. In an IT-context they are often strongly tailored to IT-decisions such as the Information Economics approach [36]. Ratio approaches are in this definition evaluation methods based on ratios mostly related to key-figures of IT-investments, e.g., IS-expenditures related to the total number of employees. Portfolio methods support the mapping of investment projects or already existing IT-services in a graphical representation. This approach is usually used in more strategic contexts. Another taxonomy aligns decision support methods among distinguishable and less overlapping groups while focusing on IT transformation projects [39]. Taxonomies may relate specifically to a certain evaluation stage, e.g., to ex-ante or ex post evaluation. It is established in literature that traditional appraisal techniques have limitations in IT appraisals regardless of the evaluation stage due to difficulties in quantifying relevant intangible benefits of IT [e.g. 24]. Methods of more contemporary nature are constantly brought forward but their consideration in practice is questioned [32]. Of growing concern is not only increasing evaluation complexity but also the problem of selecting which method to use out of the vast array of techniques [25]. Consequently, based on specific content, content and processes [45, 49] prescriptive guidelines and frameworks are appearing to guide the process of investment appraisals b, to develop a selection of appraisal methods within taxonomies and given structures [e.g. 8].

Chosen framework and methods

Based on our taxonomic review we based our four cluster taxonomy on two frameworks [39, 40] and considered a total of twenty one decision support methods in a four tier classification (see Appendix 1). Literature has suggested many more decision support methods, which, however, often seem to be extensions, combinations or variations of others. Here we focused on well-documented and representative methods with good support from literature. While we wanted to be comprehensive, the natural constraint we faced was the limited length of the research instrument. Some methods overlap and can be attributed to different classes of methods, such as the Balanced Scorecard approach that could be classified as multi-criteria approach as well as strategic method. The strategic category relies on methods that are useful for long-term planning analysing strategic value and risks without the necessity to assess short term impacts [15, 18, 34]. The fourth category of portfolio methods supports an integrated and broad view of what is to be evaluated and places investment projects or already existing IT-services into a multi-segment graphical representation [3, 52]. The financial category consists of quantitative financial approaches, such as Discounted Cash-Flow and Return on Investment considerations. Table A1 in the Appendix briefly introduces each selected method and refers to literature for a more detailed description.

RESEARCH METHODOLOGY

Survey design

The sampling frame for the empirical survey consisted of 850 randomly selected companies from the industry-independent target population defined as all enterprises in Austria with a reported last year's total balance sheet total of over €5 million. We chose to use the Amadeus Database containing financial information on 7 million public and private companies in 38 European countries [12], which supplied as with representative and extensive list with contact information for the sampling procedure. The questionnaire was administered to managers in a multi-staged procedure, who had to be an "IT-decision maker or a person that has decision making authority concerning IT-investments", a statement used as a prelude. Depending on the structure and size of the company, this can as well be an IT manager as well as a general manager. All companies were initially contacted by phone and invited for participation. Only those who indicated their interest received the link and an email for participation. This procedure was necessary to comply with the Austrian telecommunication law on bulk-Emails prohibiting invitations to more than 50 companies per Email. As an incentive companies were offered the study results, to be informed about new developments in decision making and experimental case studies in their firms. We conducted three rounds of iterative pre-testing each composed of a review by respondents and after implementation of the changes an academic review resulting in eventual changes to almost all elements of the instrument.

Sample properties

The field work was concluded with a number of 114 completed questionnaires which corresponds to net return quota of 14.5% considering neutral dropouts (63 companies). Neutral dropouts that do not decrease the return quote refer to companies that could not be contacted because they ceased to exist or closed their business, or because the address was incorrect and they could not be found. Non-response bias analysis considered potential respondents and definite non-respondents and three characteristics: The number of employee; operating revenue; and total assets. Statistical analysis revealed no evidence for response-bias. We also tested for Common Method Variance (CMV) and did not find either a single factor or a general factor accounting for the majority of covariance among measures [37]. An aggregation of the industry sectors according to NACE, the Statistical Classification of Economic Activities in the European Community [16] to four groups leads a distribution of 54% of the respondents in any service industry, 26% in industry, 11% in public administration and 9% in commerce and trade.

Table 1 Managerial roles of respondents

Respondent title	Valid N	%
Top Management (Non-IT)	28	27
Top Management (IT)	36	34
Middle Management (Non-IT)	14	13
Middle Management (IT)	26	25
Other	1	1
Non known	8	
Total	114	

We regard the aim of the survey to reach top management with decision competencies on IT as almost accomplished. Of course the respondent title does not deliver exact information about the competencies and the organizational structure of the respondent's company, but distribution of the respondents is similar to other studies, that report 32.3% of respondents being a "Head of the IT Department" [55] compared to 34% Top IT managers in this study.

Table 2 Geographical scope of respondents

Company scope	Valid N	%
Local	4	4
Regional	17	15
Austrian wide	40	36
European	30	27
Global	20	18
Total	111	

As Table 2 shows 36% of the respondents argued to operate within Austria only, while 27% do business in Europe and 18% worldwide.

DIFFUSION AND INFUSION OF IT APPRAISAL METHODS

Next, we will show results concerning diffusion and infusion for each category of the model in turn.

Multi-criteria methods

The diffusion of multi-criteria supporting methods for IT-investment decisions is at 33%, where the biggest contribution comes from the usage of the Balanced Scorecard (24%), which again could also be seen as a strategic decision support tool rather than a multi-criteria approach, depending on the viewpoint. To some extent the Utility Analyses (16%) is also known among Austrian companies. In general multi-criteria methods are not widely spread for supporting IT-decisions. Interestingly, taken together 72% of businesses know at least one multi-criteria method, but only 34% apply at least one method. In our view this is a large gap between diffusion and infusion corresponding to actual use.

Table 3 Multi-criteria methods

Level of diffusion	AHP	BSC	IE	KUF	URM	"Siesta"
known (abs.)	24	67	19	3	61	6
Used (abs.)	6	27	4	1	18	2
known (%)	21	59	17	3	54	5
used (%)	5	24	4	1	16	2

Financial methods of investment appraisal

The diffusion of financial methods exceeds the diffusion of all other approaches. 75% of all surveyed companies use any kind of financial investment appraisal methods. Although much attention is paid to Real Options in theory, the diffusion in practice is minimal. The most often used tools, are the static investment appraisal payback period (46%) and the Return on investment (45%) methods. The net present value is only used by 38% of companies. However, most of the companies that use financial investment appraisal methods, do not rely on a single method, but often use more than one. The diffusion-infusion gap is not significant here, as 90% of the managers are aware of financial methods and about 75% actually apply those in practice.

Table 4 Financial methods

Level of diffusion	Cost / Benefit Analyses	DCF / NPV	Internal Rate of Return	Payback / Break-even
known (abs.)	69	71	54	81
used (abs.)	50	43	20	53
known (%)	61	62	47	71
used (%)	44	38	18	46
	Real options	ROI	ROM	TCO
known (abs.)	20	72	21	65
used (abs.)	2	51	1	38
known (%)	18	63	18	57
used (%)	2	45	1	33

Strategic and analytical techniques

Any kind of strategic or analytical technique is known by 63% of the firms and at least one method is used by 42% of Austrian companies. While decision trees are known by half of the decision takers, only 17% actually use them. SWOT-analysis is used by 36%.

Table 5 Strategic and analytical techniques

Level of diffusion	CSF	Decision Trees	SWOT	Scenario Technique
known (abs.)	46	57	66	43
used (abs.)	27	19	41	27
known (%)	40	50	58	38
used (%)	24	17	36	24

Portfolio methods

Portfolio methods to support decision making for IT-decisions are not widely diffused. Only 11% of Austrian companies use any of the proposed portfolio methods, while

37% are knowledge about at least one technique out of this class of methods.

Table 6 Portfolio methods

Level of diffusion	Bedell's method	Investment Mapping	Investment Portfolio
known (abs.)	14	23	32
used (abs.)	3	6	7
known (%)	12	20	28
used (%)	3	5	6

Overall method infusion

The data revealed that 22% of the surveyed companies do not adopt any method at all, 25% only adopt methods from one of the proposed categories, 28% of two categories and 21% of organisations use methods from three categories and 4% of Austrian companies consider methods from all four different categories. This means that the majority of decisions were supported with at least 2 different methods. Compared with a comparable previous evaluation study in the context of ERP, method knowledge and application in practice has improved only in terms of non-financial investment method categories [7].

Table 7 Overall method infusion

No. of used method categories	Total	%
0	25	22
1	28	25
2	32	28
3	24	21
4	5	4

Decision support systems and frameworks

The usage of decision support systems (DSS) and standardized decision support framework with prescriptive processes across the companies that took part in the survey is very limited. While 107 respondents gave an answer on whether they would use either a decision support system or any kind of standardized decision support process, only 14%, respectively 21% apply either of them and only 6% apply both.

Table 8 DSS and frameworks

Usage of ...	Total	%
Decision Support System	16	14
Standardized DS Framework/Process	25	22
Both	6	5

DISCUSSION AND CONCLUSIONS

Evaluation of e-Business transformations currently is a major issue for both management and academics. This paper has introduced and defined approaches and methods used in IT investment evaluation with links into literature, which would give further insights into their application [e.g. 20, 27, 38, 40]. While these sources are relevant and insightful, they generally lack a comparative empirical investigation showing if they are known and used for e-Business decisions. We specifically add to current literature by reporting on current infusion and diffusion rates of methods. We also show that decision makers are gaining more information about methods but are not equally applying their knowledge in practice. We concluded with a link into Decision Support Systems and Frameworks showing that evaluation methods are often not combined with neither. We observed a noticeable gap between levels of diffusion (known) and infusion (used) of evaluation methods, which adds more differentiation to Smithson and Serafeimidis' [48] statement about gaps between academic theories, commercially available methodologies and actual evaluation practice within organizations. Compared to prior research [7] it seems that diffusion and infusion of more comprehensive and non-financial investment evaluation methods have increased over time. While multi-criteria decision making, and strategic and analytical techniques take a more important role in empirical IT decision processes, portfolio methods are still relatively less known and applied. A good level of inclusion of strategic and analytical techniques hint at a clearer examination of strategic value of IT, a long voiced academic prescription for IT evaluation practice [e.g. 15]. About a third of the IT assessments relied on multi-criteria methods, which promise a more holistic view and allow for a more systematic treatment of intangible benefits, another popular prescription from academia [e.g. 10, 54]. A broad assessment of what is to be evaluated called for by e.g. Ward [52] through using Portfolio methods seems to be largely missing in practice. There remains a clear emphasis on tangible costs, benefits and risks reflected by the highlighted choice and application of financial methods, which is consistent with literature [35]. The considerable gaps between diffusion and infusion rates in particular with regard to non standard financial investment analysis indicate that managers in practice seem to be aware of these methods but may have difficulties or reservations in applying them. This would warrant renewed attention to the role of organisational change in evaluation practice [45, 49], and organisational learning in the context of contemporary dynamic IT capability views [14].

Future research will aim at connecting the use of the methods with project effectiveness of and more extensively look at combined multiple method approaches in transformational IT evaluations. It is important to know which methods or combinations thereof increase satisfaction and efficiency levels. Contemporary studies call for methodological pluralism and normative standardisation [e.g. 6, 28]. Based on our findings presented in this paper future research should place an emphasis not only on new method development but also on how existing approaches can be used and combined in evaluation practice to complement the continuing trend of dominantly applied standard financial investment techniques in IT evaluation.

APPENDIX

Table A1 Descriptions of considered methods

Method and supporting references	Description
Analytical Hierarchy Process (AHP) [42, 43]	AHP is a process oriented multi-criteria approach relying on pair wise comparisons for all criteria and alternatives on pre-defined scales, which can be used to derive weights and utilities for single elements in a mathematical procedure such as the Eigenvector method. Consistency tests can be used to validate the estimated comparison matrices. The process spares the need for absolute measurements and subsequent scale transformations, and the problematic absolute estimation of attribute weight.
Balanced Scorecard (BSC) [29]	A BSC seeks to derive a structured scorecard of key performance indicators from a strategic viewpoint. These indicators can be aligned along the original four different perspectives: financial; internal business processes; learning and growth; and customer. In addition the BSC also features a cause-and-effect diagram, which displays antecedents and consequences of targets while connecting different perspectives of the scorecard with each other. It should be noted that the method can also be classified as a strategic instrument, rather than a multi-criteria approach.
Information Economics (IE) [36]	The IE approach was explicitly developed to evaluate IT-investments and essentially states that the value of an IT-investment is a sum of an enhanced Return on investment (improved operations, increased productivity, etc.), a business domain assessment (competitive advantages, management information, etc.) and a technology assessment (alignment with IS-strategy, risk measures for the project, etc.). To exercise this method weights for each factor are assigned and each factor from each alternative receives a value between 0 and 5 based on either ROI or management judgement. Factor values are multiplied with weights and summed up. Information Economics also features risk-related measures to assess the overall risk of each alternative.
Kobler Unit Framework (KUF) [23]	The KUF consists of four sequential stages comprising evaluating an investment against a checklist of critical success factors, estimating costs, evaluating business performance indicators and comparing relative benefits of alternatives. As in other multi-criteria approaches a decision is made based on weighted criteria.
Utility Ranking Method (URM) [54]	URM is rather broadly defined instrument composed of a set of alternatives, a set of criteria derived from defined targets, weights for each criteria and estimates reflecting how well an alternative performs relating to each criterion. Different aggregation methods are known to estimate a super scale used to rank the alternatives such as the weighted sum approach.
Strategic Investment Evaluation and Selection Tool Amsterdam (Siesta) [26]	The <i>Siesta</i> method features 20 criteria and strongly relies on the use of questionnaires and software to analyse the results. Similar to Information Economics the <i>Siesta</i> method is composed of domains (business and technological) and moreover three levels of decision making with a strong focus on strategic alignment.
Cost/Benefit Analyses (CBA) [33]	CBA is a decision making approach that compares the total costs against the total benefits expected from the investment alternative.
Net Present Value (NPV), Internal rate of return (IRR), Payback method [e.g. 21]	The cash flows should take the time value of money into account, which is the basic principle of most standard financial investment analyses methods such as for the NPV method where future cash flows are discounted based on a pre-defined discount rate. The IRR keeps the NPV at zero while establishing the according discount rate. The Payback Period looks for the break-even point of the investment.

Return on Investment (ROI) [e.g. 21]	Other financial performance measures include the <i>ROI</i> which in most forms compares investment returns and costs by constructing a ratio, which includes the total negative and the total positive cash flows.
Real Options (RO) [2]	RO are taking ideas from the world of financial options used in combination with the net present value to take managerial flexibility of investments into account. The NPV is enhanced with the values of managerial options.
Total Cost of Ownership (TCO) [31]	The TCO approach was originally developed to measure the total costs of an infrastructure and considers all direct as well as indirect costs of an investment over its whole life cycle.
Critical Success Factors (CSFs) [13]	The concept of <i>CSFs</i> in appraisals defines aspects vital for a company's success in light of the investment, which are no measures but rather activity statements.
Decision trees [51]	Decision trees use tree-like structure to display different alternative pathways of a decision using different types of nodes and information. The classical decision tree method assumes the future outcomes with discrete random variables and known probability functions. Input from other methods such as NPVs can be used. It supports different selection rules to arrive at an alternative selection
Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis [22]	SWOT analysis is a widely applicable evaluation tool specifying the objective of the investment and identifying the internal and external factors that can be connected with that objective in each of the four areas.
Scenario technique (ST) [5, 44]	The ST is based on the development of scenarios for a company's external environments. During the process scopes of planning possible forecasts and their impacts on the decision outcome are examined.
The Return on Management (ROM) [47]	ROM is the ratio of productive organizational energy release divided by management time and attention invested. It is a directional and qualitative metric of the payback from manager's time and attention.
Bedell's method (BM) [4]	BM is a characteristic method for portfolio analysis that explicitly deals with IT decision making balancing effectiveness and importance of IT. The assessment is based on the activities and processes that the IT solution supports and in the original method covers four variables for effectiveness issues and five determining importance. As a portfolio method the contributions of alternatives are visualised in a two dimensional portfolio.
Investment mapping (IM) [40]	IM displays the investment orientation and the benefits of the investment in a portfolio. The investment orientation covers infrastructure, business operations and market impact. The benefits are decomposed into enhancing productivity, risk minimization and business expansion.
Investment Portfolio (IP) [40]	The IP evaluates IS-investment alternatives against their contribution to the business domain, their contribution to the technology domain and the financial consequences of the alternatives drawing on NPV. The contributions to the business and technology domains represent the axis of the portfolio, while the NPV is represented by the size of the circle.

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Developing a Framework for Accounting Information Systems Adoption

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Abstract

Accounting and management decision-making is dependent on the fit of the Accounting Information System (AIS) to the organisation's requirements. Therefore, AIS plays an important role in business management, and strategic plans. It is essential to understand the AIS adoption process to ensure success in accounting systems. This research aims to explore ways of managing AIS adoption to investigate the adoption of accounting information systems within organisations. The study has led to the development of a framework for understanding the AIS adoption process in an organisation. This framework was developed from case studies and by collecting qualitative data (interviews). Case studies from six organisations involving 32 respondents were used as confirmatory evidence. The purpose of the case studies was to investigate how to choose and use (adopt) an accounting information system that best achieves organisational goals before and during the adoption of an AIS. The findings of the study's empirical evidence suggest that AIS adoption is critical in accounting information systems to provide assistance in all phases of decision making; the study also provides recommendations that may be useful to practitioners.

Keywords: Accounting Information Systems, Accounting Information Systems Adoption, Accounting Information Systems Adoption Process.

Introduction

Accounting Information Systems (AIS) are important to any organisation, especially those which are medium and large. Unlike many enterprise-wide systems, AIS systems are often purchased off-the-shelf (due to compliance requirements, etc [2]). It is also noted that (as discussed below) many information system adoption theories and frameworks have placed specific focuses on system customisation or in-house developed systems, but are seen as limited regarding the various aspects of the reasons why problems have arisen in the process of implementing accounting information software. At present it is difficult to buy accounting software matched with the actual enterprise situation, making the implementation of AIS hard, because of

their lack of knowledge and vision to adopt an AIS well [7].

However, business needs to be seen as adopting AIS well, because they require quality accounting information, which is critical to a company in order to organise, manage and operate processes across the business. Recently, when adopting AIS, some organisations used AIS vendors for adoption of accounting information systems proposed by the software vendors to the organisations who want to adopt their solutions. Other organisation used generic framework adoption guidelines by COBIT, ITIL, and SDLC to indicate how to select and adopt AIS systems, but none specific for AIS adoption.

Regarding findings from the literature, most of the research concerning AIS has focused on the management of internal controls, design of an accounting information system and auditing [3][11]. Few studies have attempted to understand how to choose and use (adopt) AIS systems well. Thus, this study aims at developing an AIS adoption framework which provides guidance to choose and use (adopt) software applications to support operations, strategic management, and decision making in an accounting information system.

Moreover, a proposed framework also attempts to identify the adoption process that organisations should focus on to ensure quality of information during system adoption. Case studies in six organisations in Thailand were used to provide useful insights into the nature of information quality management in AIS adoption. This paper describes and analyses the case studies, and then discusses the practical implications of the findings.

Background

The following literature review addresses areas including accounting information systems, systems adoption overview, and uniqueness of AIS that are relevant to the research problems. Likewise, background theories are used to focus on the research impact and develop a theoretical framework for this research.

Accounting Information Systems

Nowadays, an AIS is the system which measures business activities. An AIS can be a very simple manual system, a very complex system using the very latest in computers and information technology, or somewhere between these two extremes. The AIS will identify and capture relevant economic information, record information in a systematic manner, analyse and interpret the information, and report information that suits the needs of users for decision-making [15][17]. Moreover, in accounting firms that combine traditional accounting practices such as the Generally Accepted Accounting Principles (GAAP) with modern information technology resources (Davila, Foster *et al.* 2004), it also provides adequate controls to safeguard the organisation's assets.

Several authors (e.g. Nicolaou (2000), Phonnikornkij, Sirisom *et al.* (2008)) argue that an AIS can provide assistance in all phases of decision making. Moreover, accounting information can improve decision making in several ways: for example, it identifies situations requiring management action by choosing among alternative actions by reducing uncertainty. Furthermore, accounting information about the results of previous decisions provides valuable feedback that can be used to improve future decisions. Additionally, Xu (2003) indicates that an AIS can improve decision making by providing accurate information in a timely manner. Consequently, accounting information systems have become important considerations for any organisation that wants to perform a variety of tasks well.

System adoption overview

Figure 1 shows that some organisations use AIS vendors for implementing accounting systems. Vendors such as SAP, Oracle, and Microsoft etc seek to integrate business management systems covering functional areas of an enterprise like Finance, Human Resources, Production, Sales and Logistics etc. The Panorama Consulting Group (2011) indicate that overall market share distribution for the time period 2005-2009 of ERP vendors showed that SAP and Oracle were the top two ERP vendors where SAP ranked highest by capturing 32% of the market, followed by Oracle with 23% of total market share [13]. These organisations have specific interests in making general solutions with follow-up customisation services for organisations worldwide.

Moreover, few researchers have attempted to understand how to choose and use (adopt) systems well in organisations. For example, Moore (1999) indicates that the technology-adoption approach is particular relevant to understanding the processes and tasks of system adoption. This approach consists of a 10 step process that includes system selection, system implementation, and system use for generic adoption.

In addition, the COBIT framework employs formal concept definitions and decision rules in the adoption process. This framework has been described by four domains, consisting of Plan and Organise (PO), Acquire and Implement (AI), Deliver and Support (DS), and Monitor and Evaluate (ME) [8]. Furthermore, the Systems Development Life Cycle (SDLC) is a conceptual model used in the development and implementation of technology systems as follows: Planning, Analysis, Design, Development, Testing, Implementation and Maintenance [9]. This can help organisations to guide adoption of AIS as well. However, recently, organisations have experienced problems in the process of implementation of accounting information systems. Moreover, organisations may lack knowledge and vision to adopt AIS; accounting personnel may not understand the performance of the financial software, or may lack the knowledge and vision to adopt AIS well, making the implementation of AIS hard [6].

Therefore, in this research, the focus is placed on organisations who choose and use (adopt) these software solutions to support their accounting needs. Especially in medium and large organisations, a multi-stage adoption process is found common to ensure that the right AIS system is acquired and implemented to support the existing business operations.

The literature shows that there are many system adoption processes in use. Some are suggested by the software vendors to the organisations who want to adopt their solutions; others are generic adoption processes. This study tries to identify the common stages from these adoption processes and use these stages to study the AIS adoption issues.

Moore Phase (1999)	COBIT Phases (2006)	SDLC Phases (2007)	ORACLE Phases (2008)	MYOB Phases (2010)	Phantom's Business System Phases (2010)	SAP Phases (2010)	
1. System Selection	1. Plan and Organise (PO)	1. Planning 2. Analysis 3. System design	1. Requirements Definition 2. Design System	1. Identifying the areas points of growth 2. Taking the time to plan ahead	1. Pre-implementation checklist 2. Installing the software	1. Project preparation 2. Setting and streamlining	Stage1: AIS system Selection
2. System Implementation	2. Acquire and Implement (AI)	4. Implementation 5. Integrated and Test 6. Acceptance, Installation	3. Implementing the Specifications 4. System integration and Test	3. Data Conversion 4. Installation, set-up and configuration	3. Customising ACCPAC 4. Training	3. SAP functional development 4. Final Preparation	Stage2: AIS system Implementation
3. System Use	3. Deliver and Support (DS) 4. Monitor and Evaluate (ME)	7. Maintenance	5. System Training 6. Monitoring	5. Training 6. Post implementation review	5. Testing 6. Support 7. Issues list management	5. Turn on the SAP system for the end-users 6. Documentation	Stage3: AIS system Use

Figure1 Existing adoption process

Uniqueness of AIS

AIS have become a unique software application and work process for defining information. Specifically, findings from Davila, Foster *et al* (2004) state that management of AIS adoption involves the initial framing of the accounting adoption decision under accounting standards [5]. Many organisations, concerned to manage all processes of accounting, find that the information system is dependent on the accounting standards and laws of each country that are of relevance to develop new systems [5][6][16].

Moreover, findings from Rom and Rohde (2007) indicate that data integration in accounting systems should be studied more narrowly because AIS have unique purposes, being used for management accounting function.

What is more, at present, AIS still represents problems in organisations. Ismail (2009) argues organisation-wide implementation of a new accounting system may give rise to some problems in the process of development, specific features such as the lack of software matched with the actual situation of operation, the lack of knowledge and vision in implementation of accounting software. In addition, findings by Krishnan, Peters et al (2005) indicate that the need to ensure reliability of accounting data has long been recognised. Using the accounting information systems of management accounting data approach improves the efficiency and effectiveness of reliability assessments; although some problems have arisen in the process of development of AIS data. The present issue is that the lack of formal concept definitions and decision rules makes it difficult to develop practical data reliability for assessment accounting systems. However, business needs to be seen as employing quality accounting systems, and require accounting information quality to manage and operate processes in all sections [17].

Framework for Accounting Information Systems Adoption

The analysis of interviews was performed and common findings were presented in Figure 2. The findings from multiple case studies among the 32 respondents from 6 organisations, as given by different stakeholders in case A to case F, used together with the available literature to build the research framework, helped to provide guidelines on how to ensure quality in AIS adoption (as show in Figure 2).

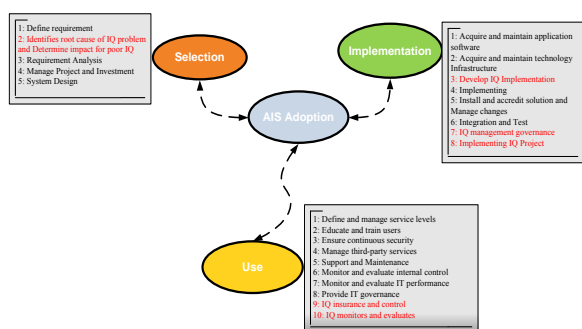


Figure 2 Framework for Accounting Information Systems Adoption Processes

- The factors in black denote the factors that are supported from the literature review and case studies.
- The factors in red denote the new factors that are findings from the case studies.

The framework shows that the adoption of process management for accounting management systems uses technology-adoption to support operations, strategic management, and decision making in the firm. The model reference framework defines 23 high-level control objectives for AIS adoption processes. These categories were identified as AIS System Selection, AIS System Implementation and AIS System Use, as identified by Moore (1999), and are discussed in the next sections.

Research Methodology

This research used qualitative, interpretive evidence. Interpretive research often involves using qualitative methods from which to develop awareness gained from the data collection, and analyses the research process [1][12]. In this study, collecting relevant information was done by conducting interviews following initial exploratory work. Literature reviews were used together with a conceptual study research method in order to develop interview questions.

The research was completed in four stages; the first stage involved a detailed and focused literature review, which led to the development of the preliminary research model representing a proactive AIS adoption process. (The prior model from the literature was used together with the pilot case study, in building the research model). A broad reading of the literature was followed by consultation with professionals in the related areas. This helped to identify and narrow the research. The second stage involved verifying the model by pilot case studies in which two large Thai organisations were used to provide useful insights into the nature of adopting an AIS.

Table 1 Overview of organisations

Case	Organisation Type	Organisation Size	Description
A	Private	Large	Private national manufacturing enterprise.
B	Public	Large	Higher educational institution
C	Private	Large	Private banking organisation
D	Private	SMEs	Private organisation of the conventional paper industry
E	Public	SMEs	Government organisation in the maintenance of assets
F	Public	SMEs	Government funded research institution

The third stage used case studies as confirmatory evidence, conducted as multiple case studies. The fourth stage involved analysis of the data to refine the data collection instruments.

Case studies in six organisations from 32 respondents

provided confirmatory evidence; these organisations were used to provide useful insights into the nature of adopting an AIS. Regarding this research, cases were selected by considering three dimensions – drawing on members of different industries, and the sizes and types of organisations, given that they have dissimilar structures, cultures, processes and outcomes (shown in table 1). This methodology has been designed to help investigate the significance of the size of organisations as this can influence the potential and actual performance of AIS. In addition, it is desirable to determine if it is possible to generate some common critical success factors for different sizes of organisations [3][18]. In terms of the first dimension, there are different types of business - agricultural, financial, industrial, education and government. Regarding final firm selections, these companies were selected as being well-known corporations in the Thai Listed Firms; they are regarded as powerful and also kindly provide high quality knowledge and valuable information for higher education providers in terms of education and data collection. Their contribution is acknowledged for the learning purposes of this research. The second dimension relates to organisation sectors, consisting of public and private groups. The third dimension focuses on the size of various organisations, especially large corporations and SMEs. The selected organisations are from Thailand but enable the dimensions to be addressed. This study used in-depth interviews to collect information as well as a semi-structured interview with different AIS stakeholders (CEO, IT/IS, accountant/auditor, data manager, accounting manager).

In addition, data collection sources also included relevant documents, such as position descriptions, policy manuals, organisational charts, service records, and annual reports. The purpose of the case study was to investigate how to best choose and use (adopt) an accounting information system, before and during the adoption of an AIS. Moreover, qualitative data analysis methods used pattern-matching, explanation-building, within-case analysis, and cross-case synthesis as data gathered from case studies was qualitative.

Research findings

Figure 2 shows a summary of case studies findings - AIS adoption process findings from multiple case studies. The results of common stages of the AIS adoption processes from twenty-three among the 32 respondents from 6 organisations as given by different stakeholders in Case A to Case F. The adoption processes of AIS, including AIS system selection, provides direction to solutions for delivering AIS system implementation; AIS system implementation provides the solutions and passes them to be turned into services, receives the solutions and makes them usable for end users, and the AIS system use monitors all processes to ensure the appropriate direction.

1. AIS System Selection

The first domain in the framework is AIS System Selection. It is made up of 5 processes that are;

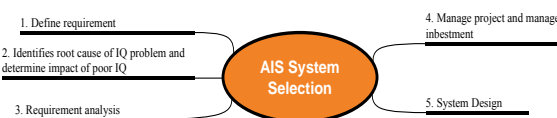


Figure 3 AIS system Selection

1. Define requirements: requirements are identified by unique accounting requirement identifiers. These requirements define the major functions of the intended application, define operational data areas and reference data areas, define the initial data entities, IT value management, business-IT alignment, assessment of current capability and performance, IT strategic plan, IT tactical plans, and IT portfolio management.

"We've defined a requirement of users involves determination of the scope and objectives of the project, the definition of project responsibilities, control requirements, project phases, budgets, and final products. We want to know current capability and performance of IT in accounting systems, unique accounting requirement, IT strategic, and IT portfolio management."

IT manager (Company E)

2. Identifies root cause of Information Quality (IQ) problem and determines impacts of poor IQ: involves identifying root causes of information quality problems and the impact of poor information quality in AIS adoption, which entails directed IT, and also in relation with critical input, processes, and output, constituting an important component, and strategic plans of accounting management.

"This stage put success criteria and metrics in place for the information quality management initiative. This phase will involve performing trend analyses on the data and the rules in place to ensure the data continues to conform to the rules put in place through the data quality management initiative."

IT manager (Company B)

3. Requirement analysis: to determine where the problem is in an attempt to fix the system. It also determines the root of problems from scratch which must be fixed in the system. It also involves information quality needs analysis to determine the accounting information document and also determines the root of information quality problems for which solutions must be found.

"In our company, requirement analysis determines where the problem is in an attempt to fix the system. Requirements gathering sometimes requires individuals/teams from users as well as service provider sides to get detailed and accurate requirements. We conduct requirement analysis by seminar, workshop, training and meetings with employees and collaborating firms to improve and solve the AIS system. Next set up team work using brain storming to find solutions and find real problems to solve. Moreover, the goal of problem analysis is to obtain a clear understanding of the requirements of the client and the users."

IT manager (Company A)

4. Manage project and manage investment: cost justification such as operational control, product costing and profitability analysis.

"after the requirement analysis step, we have to write plans for presentation to the organisation board to approve all planning including budget, details of all phases as development, who is undertake this project, schedule time of all process. Manage team

work to support project, set up team work to support all phases of system.”

IT manager (Company A)

5. **System design:** the purpose of the design phase is to plan a solution for the problems specified by the requirement document. It involves detailed design of all inputs, processing, storage, and outputs of the proposed accounting system.

“I think the design phase takes the conceptual results of the analysis phase and develops detailed, specific designs that can be implemented in subsequent phases. It involves the detailed design of all inputs, processing, storage, and outputs of the proposed accounting system. Inputs may be defined using screen layout tools and application generators. Processing can be shown through the use of flowcharts or business process maps that define the system logic, operations, and work flow, and output refers to the activity of creating prototypes of software applications. A prototype is to allow users of the software to evaluate developers' proposals for the design of the eventual product.”

IT manager (Company B)

2. AIS System Implementation

The second domain in the framework is AIS System Implementation. It is made up of 8 processes that are:

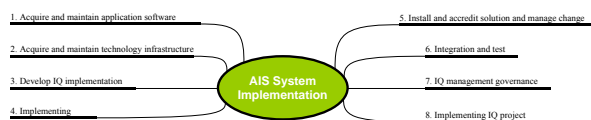


Figure 4 AIS system Implementation

1. **Acquire and maintain application software:** writing the accounting program based upon business objectives, user requirements, real processes of accounting, accounting standards, role of management accounting, and accounting techniques. Applications are made available in line with business requirements. This process covers the design of the applications, the proper inclusion of application controls and security requirements, and the development and configuration in line with accounting standards. This allows organisations to properly support business operations with the correct automated applications.

“In our company, programmers are writing accounting programs built upon accounting objectives that are relevant to business objectives, user requirements, real processes of accounting, accounting standards – GAAP, TFASB, and accounting standards of Thailand. And also organising cautious IQ management to improve work processes by enabling work processes of all sorts as well as decision-making. In addition, the organisation uses continuous information quality improvement by specific IQ criteria, and IQ metrics focused on writing programs. Moreover, organisations have strict governance of IQ roles, IQ strategic, IQ Audit and providing accountability and rewards.”

IT manager (Company B)

2. **Acquire and maintain technology infrastructure:** organisations have processes for the acquisition, implementation and upgrade of the technology infrastructure. This requires a planned approach to acquisition, maintenance and protection of infrastructure in line with agreed-upon technology strategies and the provision of development and test environments. This ensures that there is ongoing technological support for accounting applications.

“we require a planned approach to acquisition, maintenance and protection of infrastructure in line with agreed-upon technology strategies and the provision of development and test environments. This ensures that there is ongoing technological support for accounting applications that are relevant to business objectives.”

IT manager (Company A)

3. **Develop Information Quality (IQ) implementation:** involves applications being made available in line with accounting requirements. the IQ programme should emphasize the benefits that the organisation expects to realise through its information quality management system. The programme could be run either by the implementation team or by experts hired to talk to different levels of employees. The implementation progress should be monitored to ensure that the information quality management system is effective, conforms to accounting objectives and meets the information quality policy objectives. The activities include a documented procedure for dealing with user feedback, data verification, a review of the data input and processing procedures, product master data management, preventative action and determine and implement action needed.

“I think IQ implementation is important in the organisation so that we're always developing IQ to improve work performance in the accounting department. We ensure applications are made available in line with business requirements as specifics to check all processes of quality information within development and configuration in line with standards. I think, in essence, implementation should cover all the accounting objectives established by the top management.”

IT manager (Company E)

4. **Implementing:** involves accounting solutions which can be customized to meet accounting needs. This process requires the production of documentation and manuals for users and IT, and provides training to ensure the proper use and operation of applications and infrastructure. In addition, planning for operational solutions such as knowledge transfer to accounting management, knowledge transfer to end users and knowledge transfer to operations and support staff.

“I think the implementation phase consists of primarily construction and delivery. Construction includes the selection of hardware, software and vendors for the implementation, building, and testing of the network communication systems. This involves building and testing the databases, writing and testing the new program modifications, and installing and testing the total system from a technical standpoint. The delivery also includes the process of conducting final system and user acceptance testing, preparing the conversion plan, installing the production database, training the users, and converting all operations to the new system.”

IT manager (Company B)

5. **Install and accredit solution and manage change:** all changes, including emergency maintenance and patches, relating to infrastructure and applications within the production environment are formally managed in a controlled manner. This assures mitigation of the risks of negatively impacting the stability or integrity of the production environment including change standards and procedures, impact assessment, prioritisation and authorisation, emergency

changes, change status tracking and reporting, change closure and documentation.

"We have changed the old system in parallel with the new system and also we have training before using the new system. In addition, users can check and correct data by comparing with the old system, manual, and documentation."

IT manager (Company B)

6. Integration and test: this stage is the process of data conversion, transfer and integration with the existing accounting system. This phase is to ensure that various system parts, related components and programs work properly together. Integration testing includes data set testing, system testing, integration testing, automation testing, user acceptance testing, grant user testing, security testing, performance testing.

"We have tested at various levels; software testing, system testing and user acceptance testing are often performed...we have been testing our accounting system including data set testing, system testing, integration testing, automation testing, user acceptance testing, grant user testing, security testing, performance testing. We have integration of new systems in parallel with old systems to make sure the new system can replace the old system for a long time."

IT manager (Company B)

7. Information Quality (IQ) management governance: this phase uses information quality management software and develops data governance processes to help improve corporate data assets. The initial step in the implementation of a data governance program involves defining the owners or custodians of the data assets in the enterprise. A policy must be developed that specifies who is accountable for various portions or aspects of the data, including its accuracy, accessibility, consistency, completeness, and updating.

"We have to do IQ management governance because following company policy and look at International finance cooperation's strategic IQ project, following best practice by using quality management software and developing data governance processes to help improve my company. We developed guidelines that specify who is accountable for various portions or aspects of the data, including its accuracy, accessibility, consistency, completeness, and updating."

IT manager (Company E)

8. Implementing Information Quality (IQ) project: implementing a data management initiative involves a combination of people, processes, and technology. And also IQ project can be implemented in the form of stand-alone- data quality initiatives, compliance efforts, master data management projects, and data warehousing projects, among others.

"we see Implementing IQ project as important to properly managing all processes within the AIS system in the organisation. Implementing a data management initiative involves a combination of people, processes, and technology. Moreover, documenting the scope of a information quality project in terms of project objectives, tasks, schedule, deliverables, and resources provides the overall scheme for performing a information quality project."

IT manager (Company E)

1. AIS System Use

The third domain in the framework is AIS System Use. It is made up of 10 processes that are:

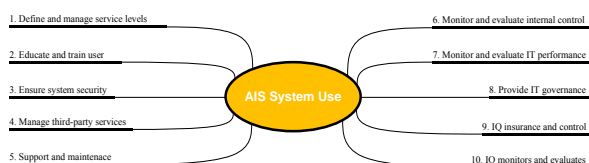


Figure 5 AIS system Use

1. Define and manage service levels: this process enables alignment between IT services and the related accounting requirements, including monitoring and timely reporting to stakeholders on the accomplishment of service levels.

"In our company we define and manage service levels to efficiency as each person and work to each specific job. This process also includes monitoring and timely reporting to stakeholders on the accomplishment of service levels. This process enables alignment between IT services and the related business requirements."

IT manager (Company A)

2. Educate and train user: effective education of all users of accounting systems, including those within IT, requires identifying the training needs of each user group. This process includes defining and executing a strategy for effective training and measuring the results. An effective training programme increases effective use of technology by reducing user errors, increasing productivity and increasing compliance with key controls, such as user security measures, accountancy measures, and manager measures, identification of education and training needs, delivery of training and education, evaluation of training received.

"When the organisation has new systems, we always have training before using AIS program. We have two level of training, firstly, general training for all people and secondly, training by function of software for each level of detailed different work processes."

IT manager (Company B)

3. Ensure system security: the need to maintain the integrity of information and protect IT assets requires a security management process in accounting systems. This process includes establishing and maintaining IT security roles, accounting security roles and responsibilities, policies, standards, and procedures. Security management in accounting system also includes performing security monitoring and periodic testing and implementing corrective actions for identified security weaknesses or incidents. Furthermore, effective security management protects all accounting assets to minimise the business impact of security vulnerabilities and incidents including management of IT security in accounting systems, IT security plan, identity management, user account management, security testing, surveillance and monitoring, security incident definition, protection of security technology, cryptographic key management, malicious software prevention, detection and correction, network security, exchange of sensitive data.

"in our company we are concerned by system security, we check everything including establishing and maintaining IT security roles, accounting security roles and responsibilities, policies, standards, and procedures. Security management in accounting system also includes performing security monitoring and periodic testing and implementing corrective actions for identified security weaknesses or incidents. Moreover, we have undertaken reviews to determine the efficiency and effectiveness of the system every week, checking and managing database. And also we backup accounting data everyday at midnight."

IT manager (Company A)

4. Manage third-party services: the need to assure that services provided by third parties (suppliers, vendors and partners) meet accounting requirements requires an effective third-party management process in organisations. This process is accomplished by clearly defining the roles, responsibilities and expectations in third-party agreements as well as reviewing and monitoring such agreements for effectiveness and compliance. Also effective management of third-party services minimises the business risk associated with non-performing suppliers including identification of all supplier relationships, supplier risk management, supplier performance monitoring.

"We have to manage third-party services by clearly defining the roles, responsibilities and expectations in third-party agreements as well as reviewing and monitoring such agreements for effectiveness and compliance."

IT manager (Company A)

5. Support and Maintenance: support and maintenance for users is needed. Support helps development by continuously improving the business through adjustments to the accounting information systems caused by business and environmental changes. These changes might result in future problems, new opportunities, or management or governmental directives requiring additional system modifications.

"Support has two objectives. The first is to update and maintain the accounting information systems. This includes fixing problems and updating the system for business and environmental changes. For example, changes in generally accepted accounting principles (GAAP) or tax laws might necessitate changes to conversion or reference tables used for financial reporting. The second objective of support is to maintain development by continuously improving the business through adjustments to the accounting information systems caused by business and environmental changes. These changes might result in future problems, new opportunities, or management or governmental directives requiring additional system modifications. Vendors come to support all AIS processes 3 times per year. Otherwise, organisation can contact vendors via email, telephone, and monitor via networks supporting AIS systems."

CEO (Company F)

6. Monitor and evaluate internal control: organising an effective internal control programme for accounting requires a well-defined monitoring process. This process includes the monitoring and reporting of control exceptions, results of self-assessments, third-party reviews, accounting report actions, and an internal control framework. A key benefit of internal control monitoring is to provide assurance regarding effective and efficient operations and compliance with applicable laws and regulations.

"In our company, this stage provides monitoring and evaluation of AIS performance, monitoring of internal controls, compliance with regulations and providing governance of the system. This process applies to IT-related activities and identifies improvements."

Accounting Manager (Company C)

7. Monitor and evaluate IT performance: effective IT performance management requires a monitoring process in accounting systems. This process includes defining relevant performance indicators, systematic and timely accounting reports of performance, and prompt responses to diversions from standards. Furthermore, monitoring is needed to make sure that the right things are done and are in line with the set directions and policies in an organisation including

monitoring the approach, definition and collection of monitoring data, monitoring method.

"This process is focused on management reporting, customer satisfaction assessments, external benchmarking. We need to make sure the right things are done and satisfaction of management and the governance entity with the performance reporting by defining relevant performance indicators, systematic and timely accounting report of performance, and prompt acting upon diversions."

Accounting Manager (Company E)

8. Provide IT governance in accounting systems: this process defines organisational structures, processes, leadership, roles and responsibilities to ensure that enterprise IT investments are aligned and delivered in accordance with accounting strategies and objectives. This process is concerned with integrating IT governance with corporate governance objectives and complying with laws, regulations and contracts.

"In our company, we focus on the quality of reporting on IT to stakeholders, frequency of reporting from IT to the board, frequency of independent reviews of IT compliance. We have been approving IT strategic plans and controlling major investments within the goals of IT governance."

Accounting Manager (Company E)

9. Information Quality (IQ) insurance and control: the process of controlling the usage of data with known quality measurement—for an application or a accounting process. This process is usually done after a data quality assurance process, which consists of discovery of data inconsistency and correction.

"We have to prepare data for transfer from an old system to a new system. This section describes the strategy to be used to ensure data quality before and after all data conversions. This section also describes the approach to data scrubbing and quality assessment of data before they are moved to the new or converted system. The strategy and approach may be described in a formal transition plan or a document if more appropriate. Transfer data uses Excel templates then transfers to the SQL database. To check all processes of ensuring security we spend more than 6 months on management. We have been using data profiling and data cleansing to manage all data quality. Also every day we have to transfer and backup data to make sure that data is correctly stored."

Accounting Manager (Company E)

10. Information Quality (IQ) monitors and evaluates: this process is an important step for measuring the impact and effectiveness of a information quality program. Measuring and monitoring the IQ attributes is essential for success in an accounting system. The ability to monitor information quality processes is critical, as it provides the organisation with identifying all applicable laws, regulations and contracts and the corresponding level of IT compliance and optimising IT processes to reduce the risk of non-compliance.

"We provide AIS performance by monitoring internal controls, complying with regulations and providing governance. Monitor information quality: The ability to monitor the data quality processes is critical, as it provides the organisation with a quick snapshot of the health of the data within the organisation. Through analysis of the data quality scorecard results, a data governance committee will have the information needed to confidently make additional modifications to the data quality strategies in place, if needed. Conversely, the scorecards and trend analysis results can also provide peace of mind that data quality is being effectively addressed within the organisation. And also we measure conformance with established business rules and develop exception reports"

CEO (Company C)

Discussion and Conclusions

This analysis was done on the data of 32 respondents at six organisations from manufacturing firms in Thailand collected by in-depth interviews which involved on semi-structured interview. This study investigates the adoption of accounting information systems within organisations. The developed framework provides guidance on how to choose and use (adopt) an accounting information system that best achieves organisational goals. The study indicates that common stages of AIS adoption define 23 factors. Specifically, these new factors, based on the research findings and the literature and unique to AIS adoption, include identifying the root causes of IQ problems and determine the impact of poor IQ in the AIS System Selection stage, develop IQ implementation, implementing the IQ project in the AIS System Implementation stage, and IQ insurance and control, IQ monitoring and evaluating in AIS System Use stage (as shown in Figure 2). The evidence in this study suggests that information quality criteria promote AIS adoption process performance.

As a result, this study makes a contribution to the information systems literature by providing evidence on the usefulness of AIS adoption in enhancing accounting performance. This evidence suggests that organisations should obtain knowledge of appropriate systems, in order to best choose and use (adopt) accounting information systems to improve work processes as well as help organisations to make profits.

Limitations & future research

The results of this study are only drawn from Thai organisations; there might or might not be similar results if a study was conducted in other Asian countries. Whether or not there are similarities and differences needs to be further investigated. It is acknowledged that cultural differences may impact the results, but these are beyond the scope of this research; those issues could be addressed by further research. To improve the level of reliable results, future research is needed to collect data from other populations, mediators and moderators with respect to a framework for the accounting information systems adoption process.

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THE RELATIONSHIP BETWEEN FACEBOOK USERS' SELF-SYSTEMS AND SOCIAL CAPITAL EFFECTS

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ABSTRACT

The study examined how the self-systems of users of the social networking website Facebook (where a self-system comprises four elements—self-efficacy, self-assertion, social presence, and self-esteem) and intensity of use affected the above mentioned social relations and the social capital effect. The study also found that bridging and bonding social relationships are mediated by Facebook users' self-systems and social capital effects. The study's findings provide potentially significant implications that can be used to develop guidelines and a framework for assessing SNS users' behavior.

Keywords: SNS, Facebook, Self-System, Social Capital.

Introduction

Relationships with others are important both for generating offline benefits—most commonly, social capital—and for psychological development in young people [1]. Maintaining friends through SNSs allows users to engage in social activities as well as to build social capital in online settings [2,3]. Many researchers have investigated the meaning of communication and relationships in the context of online networking sites. Recently, major journals have published special issues regarding social media, SNSs (e.g., blogs and SNS and online communities), social capital, and the relationship between user behavior and communication technologies. Related articles have focused on the social and psychological impact of social media and SNSs [1,3,4], but research on the relationship between the self-systems of SNS users and the building of social capital is insufficient. Therefore, this study will attempt to explore how individual SNS users' self-systems (based on self-efficacy, self-assertion, social-presence, and self-esteem), when considered in conjunction with intensity of use, influence social capital building. The study also investigates whether specific types of social relationships that are established through SNS use mediate social capital effects.

Furthermore, few empirical studies have attempted to build a theoretical model that explains individual SNS users' self-systems as a

factor affecting social relationships and moderating social capital effects. Thus, the goals of this study are: 1) to understand how the structure of individual Facebook users' self-systems affect social relationships and mediate social capital effects, and 2) to suggest a model that explains the relationship between such self-systems and social capital. An investigation of the relationship between user self-systems and the building of social capital will help provide valuable data to support a theory of social networking sites.

Theoretical background

Social Capital and Social Network Sites

The term *social capital* is widely used in social science. The study of social capital has focused on individual social relationships as well as on how the use of mass media influences an individual's relationships with others and with society as well as social trust. Lin defines social capital as an investment in social relations on the part of individuals through which they gain access to embedded resources to enhance expected returns on instrumental or expressive actions [5, p.35]. Social capital complements the concepts of economic capital and human resources by incorporating the role of social relations.

SNSs might help individuals create and maintain social capital because the technical and social affordances of SNSs enable interaction, and therefore reciprocity, within a larger network of social connections [6, p.246]. SNSs might not increase the number of strong ties that people have, but the SNS technology supports the formation and maintenance of weak ties, increasing what is known as the *bridging* social capital of its users [7]. Putnam has distinguished between *bridging* and *bonding* social capital [8]. Bridging social capital comprises loose connections or weak ties between individuals, the thin and impersonal trust that we develop with strangers with whom business or social engagements bring us in contact. Bonding social capital refers to close relationships in which emotional support is exchanged in the context of dense, multi-functional ties that are capable of bringing heterogeneous groups together in meaningful or productive interactions [2,3,9]. In

the light of this distinction, this study attempts to investigate the relationship between SNS users' self-systems and both bridging and bonding social relationships in general and social capital in particular.

Social capital effects are social relationships and related resources that are made available through social networks. Social capital effects fall into two categories, social-level social capital and individual-level social capital [8,10]. Social-level social capital builds on social trust, networking, social norms, and a spirit of community. Shah et al., divided social capital effects into relationships based on civil involvement and relationships based on interpersonal trust [10]. People acquire psychological resources such as social acknowledgment and a sense of belonging through building social capital. Thus, trust and reciprocity, as psychological resources, play important roles that merit investigation in order to better understand how social capital effects generate individual-level social capital. Reciprocity, which is an important factor in determining the quality of social networking connections among members of a community, involves emotional support and a feeling of sharing and belonging among members of a specific networking chain [11]. Beaudoin and Thorson studied the relationship between the use of mass media, social capital, and social participation, finding that social capital is closely related to social participation as a pro-social behavior [12]. Based on these studies, the present study regards social trust, reciprocity, and social participation as key factors in generating social capital effects.

Self-systems (Self-efficacy, Self-assertion, Social-presence, Self-esteem) and Intensity

To understand what a self-system is, it is necessary to understand the concept of the self and analyze it into its various elements. Many trace the origin of the modern concept of the self as a psychological construct to the work of William James in the 1890s. James, a psychologist and philosopher, claimed that the self involves 'anything that one owns,' analyzing the concept to include the 'I: self as a knower,' or the pure self, and the 'me: self as known,' the empirical self. Although these concepts have been superseded as psychology has matured, the distinction between the self as the subject of cognition and the self as the object of cognition remains useful [13].

Employing such a self-concept, people can examine and evaluate themselves and everything they own objectively. This awareness supports the formation of a *personality* based on consistency of the self-concept and behavior. Consistent behavior facilitates the development

of self-esteem and predictability in interactions with other people [14]. Along with self-esteem, other key components of a self-system embody one's views of the self and one's standards or aspirations for oneself [15-17]. According to Dubois et al., a self-system comprises four elements, including self-esteem, self-description, standards for self-evaluation, and self-value [15]. Across the relevant literature, self-efficacy [18], self-assertion [19,20], and social-presence [21] have also been identified as elements of the self-system.

The evaluation of the self that forms the basis for self-esteem has been viewed as resulting from (a) an individual's appraisal of the descriptive content of the self relative to (b) the individual's internal standards or aspirations [15, p.14]. Self-esteem is thought to include faith in the self and feelings of self-worth, and reflects one's overall emotions and attitudes towards the self [22,23]. Bandura defined *self-efficacy* as the judgment of one's ability to execute a particular behavior pattern [24, p.240]. Self-efficacy has been used as a theoretical framework in communication studies because it is closely associated with work-related performance, helping to explicate the relationship between self-efficacy and adaptability to new technology and mass media user behavior [18,25]. Garrison, Anderson, and Archer defined a factor termed *social-presence* in this study as the ability of participants in a Community of Inquiry to project their personal characteristics onto the community, thereby presenting themselves to other participants as real people [26, p. 89]. Dunlap and Lowenthal pointed out that this theory took on new importance with the rise of computer-mediated communication (CMC) and, later, online network analysis [21].

Self-assertion refers to one's feeling, desire, or need to express oneself to others [19,27]. Bolton compared listening and self-assertion to the negative and positive of communication [20]. Self-assertion combined appropriately with listening helps one to maintain ideal relationships with others. People with higher self-assertion develop self-value as well as the ability to help others express themselves in the course of developing relationships.

Intensity refers to amount and frequency of mass media use. When applied to Facebook, intensity has been called *Facebook intensity* [1]. In the present study, the self-system construct, as indicated in the aforementioned studies, is regarded as a function of one's self-efficacy, self-assertion, social-presence, and self-esteem. The study then takes into account the factor of intensity, especially Facebook intensity, to study the effects of Facebook use and self-systems on social relationships and social capital.

Hypotheses

SNS Users' Self-systems and Bridging and Bonding Social Relationships

Various factors related to self-systems have been employed in the literature on communication and consumer behavior. One self-system element is self-efficacy, which has been used mainly to explain the behavior of mass media users, such as, for example, the acceptance of information technology [28]. Self-efficacy plays an important role in determining user behavior [28]. Straub argued that self-efficacy is always a forward-thinking factor pertaining to judgments based on beliefs about personal capabilities [29]. It is not to be confused with self-esteem. The development of self-efficacy is thought to include the following factors: mastery experience, vicarious experience, verbal persuasion, and psychological and affective states [24, 29]. Some research has found that self-efficacy plays a critical role in influencing post-outcome behavior [29]. These studies of self-efficacy provide one of several theoretical perspectives suggesting that both bridging and bonding social relationships function as basic determining factors in building social capital.

The self-assertion construct was developed by Wolpe and Lazarus [30]. Wolpe defined self-assertion as one's feeling of being able to express oneself to others without interpersonal anxiety [27], and it has been characterized in social psychology as behavior involved in expressing intimacy as a strategy for maintaining interpersonal relationships [31]. Self-assertion is generated in proportion to the degree of intimacy, response, and commitment to others that one feels [32]. Thus, self-assertion is significantly affected by aspects of a person's relationship with others.

Short et al. refer to social-presence is a key to understanding face-to-face communication as well as one of the most important perceptions involved in social circumstances [33]. Rice pointed out that social-presence stems from interaction with others, so it applies to the present research because SNSs are characterized by two-way communication and interactivity [34]. Dunlap and Lowenthal pointed out that Twitter seems to provide an additional means for enhancing social-presence [21] because Twitter is a multiplatform Web 2.0 tool—part social networking site, part microblog—that is freely accessible on the Internet [35].

Straub et al. describe social-presence theory as a means of explaining how social context affects media use [29]. Social-presence theory argues that users of media assess the degree of social-presence required by the task and fit it to the medium, that is, to the way in such a medium enables a communicator to experience communication partners as psychologically present [33,36]. High social-presence is typically

found in face-to-face communication whereas low social-presence is often found in e-mail and paper-based mail [37].

Self-esteem, the manner in which an individual evaluates self-characteristics relative to the perceived characteristics of peers, is a crucial variable for understanding identity development, and underpins the development of mental health adjustments [38, p.82]. Self-esteem refers to typical attitudes and affections towards oneself. It involves confidence, whether one sees oneself as trustworthy, and negative or positive evaluations of one's value [39]. Steinfield et al. found that SNSs help people with lower self-esteem to engage with others outside of their close personal networks. Self-esteem is therefore closely related to SNS user behavior [6].

Middleton and Leith argued that intensity in the use of SNSs should be measured along two dimensions: frequency of use and hours of use. Longevity of usage is also of interest in exploring engagement with Facebook [40, p. 6]. Steinfield et al. found that Facebook use positively influences bridging social capital based on their finding that Facebook use has significant predictive power regarding the generation of bridging social capital using online social networking websites [6]. Therefore, it is possible to assume that the components of self-systems affect bridging and bonding social relationships as well.

The foregoing review of the literature and theoretical constructs pertaining to self-systems and the use of SNSs provides the framework within which this study examines how the elements of self-systems affect social relationships and social capital effects as well as how the addition of intensity as a factor plays into these relationships. Focusing on self-systems first and applying the study to Facebook use yields the following set of hypotheses:

H1: When using Facebook, the higher the self-efficacy, the stronger the bridging social relationships (H1-1) and bonding social relationships (H1-2).

H2: When using Facebook, the higher the self-assertion, the stronger the bridging social relationships (H2-1) and bonding social relationships (H2-2).

H3: When using Facebook, the higher the social-presence, the stronger the bridging social relationships (H3-1) and bonding social relationships (H3-2).

H4: When using Facebook, the lower the self-esteem, the stronger the bridging social relationships (H4-1) and bonding social relationships (H4-2).

H5: When using Facebook, the higher the intensity of Facebook use, the stronger the

bridging social relationships (H5-1) and bonding social relationships (H5-2).

SNS and Social Capital Effects

Social networks are critical to human psychological well-being; this principle has been well documented and remains relevant to researchers today [41]. SNSs are designed to foster social interaction in a virtual environment [42, p.228]. An SNS provides web-based services that allow individuals to construct publics, that is, groups of people with whom they are not otherwise acquainted who willingly interact with them over the Internet [43, p.211]. A social network is a configuration of people connected to one another through interpersonal means, such as friendship, common interests, or ideas [44, p.13]. SNSs provide easy-to-use tools with which current users can invite others to join a network. Typical SNSs allow a user to build and maintain a network of friends for social or professional interaction. The core of an SNS consists of personalized user profiles [45, p.92].

Social capital theory has been long applied in computer-mediated environments to explore SNS user behavior. Social capital is described as the resources that are created in social networks and relationships between people that provide value or benefits for individuals participating in the network and for their relationships [3, p. 644]. Putman suggested that there are two types of social capital, bridging and bonding social capital [8]. Bridging social capital is characterized by loose connections between individuals linked by “weak ties,” whereas bonding social capital is characterized by very close relationships linked by “strong ties” [9]. Differences in SNS users’ self-systems might affect the two types of social relationships.

Putman emphasized trust, civic engagement, and participation as playing critical roles in building social capital [46]. To investigate the relationship between the use of SNSs and social capital building, the following elements should be considered: trust, social participation, and reciprocity [10,11,47]. These factors play an important role in bridging and bonding between people using SNSs.

In summary, the present study investigates the relationship between SNS user behavior and social capital effects. Likewise, it can be hypothesized that social capital effects, which are characterized by trust, social participation, and reciprocity, affects both types of social capital.

H6: When using Facebook, bridging social relationships (H6-1) and bonding social relationships (H6-2) will mediate the relationship between user self-systems and social capital effects.

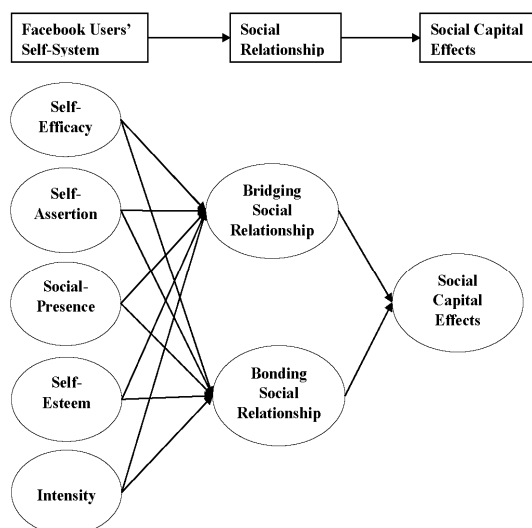


Figure 1 Suggested Research Model

Research methodology

This study takes an empirical approach as it attempts to analyze the relationship between the exogenous variables related to SNS users’ self-systems and the endogenous variables related to social capital effects. Bridging and bonding social relationships are used as moderating variables.

Sampling and Data Collection

The population of this study was identified by convenience samples among Facebook users, with almost every participant working in a business-related field. The purpose of the randomly collected sample was to capture representative consumer segments and to avoid a demographically homogeneous sample. The questionnaires were distributed to the public personally, through a research assistant.

Three hundred and six users out of the 400 contacted returned the study questionnaire. The response rate was therefore satisfactory, at 77%. The sample respondents consisted of 156 men and 150 women, with 316 questionnaires being administered for the study. The eventual analysis included 306 respondents because 10 questionnaires were deleted due to the high number of missing values or lack of Facebook use.

Instrument Construction

Exogenous Variables

To measure the role of the self-system, the variables were self-efficacy, self-assertion, social-presence, and self-esteem. The other key variable was intensity.

Self-efficacy. Three items were selected based on factor loadings, item total correlation, and item difficulty, while maintaining a multi-faceted scale. Participants had to check-mark their agreement with the following

statements: 1) I get used to new technology and products very well 2) I think that my ability to adopt new technology is greater than that of others and 3) I am able to understand the function of new technology and use it effectively.

Self-assertion. Four items were selected to measure self-assertion: 1) I'd like to publish an essay on the use of SNSs or talk about it with others, 2) I often suggest or give my opinion about social issues on SNSs, 3) I share my knowledge and experience with others using SNSs, and 4) I like to express my opinion about important issues through messenger boards, billboards, or e-mail on SNSs.

Social-presence. Three items were selected to check-mark agreement with the following statements: 1) I feel the warmth of others when I am using Facebook, 2) I intend to converse warmly when I am using Facebook, and 3) I felt a sense kinship with others when I am using Facebook.

Self-esteem. The items used to measure self-esteem were as follows: 1) I think my friends are better than me, and 2) I am just as smart and competent as others are, and 3) I sometimes feel like I am worthless.

Intensity. The items used to measure intensity were as follows: 1) Facebook has become part of my daily routine, 2) I feel out of touch when I haven't logged onto Facebook for a while, and 3) I feel I am part of the Facebook community.

Endogenous Variables

Bridging social relationships. Three items were used to measure bridging social relationships: 1) I have the chance to meet people who live in different areas through using SNSs, 2) I have the chance to meet people from a different socioeconomic background through using SNSs, 3) I have the chance to meet people who live in the same local community through using SNSs.

Bonding social relationships. Three items were used to measure bonding social relationships: 1) I have the chance to meet people who belong to an organization I belong to through using SNSs, 2) I have the chance to meet people who live in the same local community through using SNSs, 3) I have the chance to meet people or members of organizations who have the same beliefs or common interests through using SNSs.

Social Capital Effects. The components of social capital effects in this study were analyzed into three subordinate concepts: trust, reciprocity, and social participation. Social capital effects were measured in reference to nine items eliciting respondents' opinion about trust, reciprocity, and social participation: 1) believability, 2) trustworthiness, 3) fairness for trust, 4) strong solidarity, 5) fellowship, 6) a

sense of comradeship for reciprocity, 7) intention to participate in a non-profit organization, 8) intention to participate in a civic organization, and 9) intention to participate in a social organization or political party. Items were scored on a 5-point Likert scale with 1 indicating "strongly disagree" and 5 indicating "strongly agree."

Data analysis

The aim of this study was to investigate the relationship between SNS users' self-systems, bridging/bonding social relationships, and social capital effects. In order to verify the hypotheses, demographic data were analyzed using a statistical package, SPSS 15.0, and Covariance Structure Analysis was conducted using EQS6b and MLE (Maximum Likelihood Method).

Assessment of the Self-system and Social Capital Measurement Model

This study carried out required procedures for building a structural equation model and assuring model goodness of fit. For example, normality and sample adequacy were examined according to the standards of evaluation of measurement models suggested by Hair et al. [48], according to which mean of skewness and kurtosis should fall within the range of ± 1.96 , which this study satisfied.

According to Hair et al. [48], a measurement model should be evaluated for convergent validity and discriminant validity. This study assessed convergent validity using Cronbach's alpha, following Bagozzi and Yi [49] and Hair et al. [48], and composite construct reliability and AVE (Average Variance Extracted) following Fornell and Larker [50]. Discriminant validity was assessed by comparing the correlation of components to AVE.

As seen in <Table 1>, the Cronbach's alpha mean for all concepts is above 0.7. According to Nunnally, the Cronbach's alpha mean should be 0.6 or higher, so in this respect this study has sufficient reliability [51,52]. The study's AVE also satisfied the standard of 0.5 of AVE suggested by Bagozzi and Yi and Hair et al., which means the measurement indexes exhibit convergent validity [48,49].

	Items	α	C.R	AVE
Self-Efficacy	3	.897	.980	.762
Self-Assertion	4	.892	.970	.649
Social-Presence	3	.794	.972	.749
Self-Esteem	3	.761	.972	.786
Intensity	3	.825	.966	.775
Bridging-SR	3	.870	.974	.846
Bonding-SR	3	.840	.973	.798
Social Capital	9	.823	.979	.666

Table 1 Internal Consistency of the Constructs

In order to verify discriminant validity, the AVE of each of the two potential factors was compared with the square of the correlation between the two potential factors. In this study, the means of the squares of the correlation coefficients (r^2) are smaller than AVE. Fornell and Larker suggested that AVE should be larger than the means of the squares of all correlation coefficients [50]. The extracted AVE is between .666 and .846, and the means of the squares of the correlation coefficients are between .004 and .592, which results in an AVE that is larger than the means of the squares of the correlation coefficients (r^2). This also ensures the discriminant validity that is required for research hypotheses model verification. It also means the data collected for the verification ensure discriminant validity.

Model goodness of fit was verified using the measurement variables that were subjected to assessment of reliability, convergent validity, and discriminant validity. $\chi^2=449.3$, $df=357$, and $p=.000$, CFI=.983, GFI=.914, AGFI=.881, NFI=.925, NNFI=.978, SRMR=.051, RMSEA=.029. This is an acceptable goodness of fit considering the measurement of the structural equation model, which means that the measurement methodology of this study is sufficiently reliable.

Tests of Hypotheses

The structural equation model was used to verify the hypotheses associated with the proposed model. Goodness of fit is considered acceptable considering the measurement of the structural equation model. As proved previously, the research model hypotheses for this study satisfy the advised base values. The goodness of fit of the model hypotheses yielded $\chi^2=(340)=525.9$, CFI=.966, NFI=.912, NNFI=.954, GFI=.899, AGFI=.853, SRMR=.126, RMSEA=.042, which means that the model's goodness of fit satisfies the advised base values. The model tends to be selected even though it does not satisfy the requirements because the structural equation model is likely to be sensitive to sample size, which applied to hypothesis verification in this study as well. Thus, the assumptions remained within acceptable boundaries.

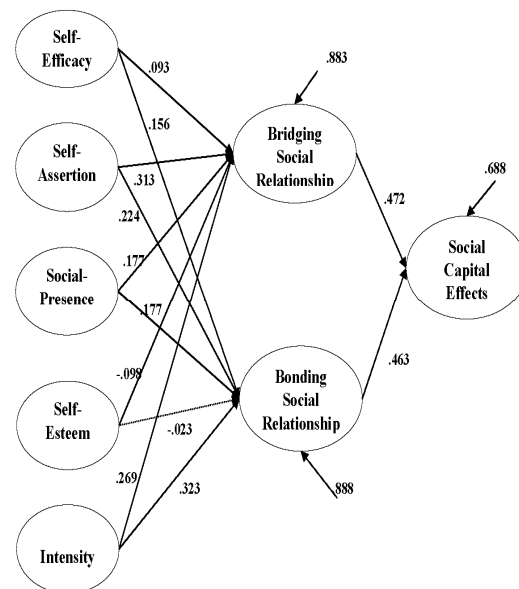


Figure 2 Results of Suggested Research Model with path Coefficients

Path	Std. Error	Standardized (Unstandardized) Coefficient
Self-Efficacy -> Bridging-SR	.062	.093**(.113), $z=1.834$
Self-Assertion -> Bridging-SR	.071	.313***(.380)
Social-Presence -> Bridging-SR	.085	.177***(.276)
Self-Esteem -> Bridging-SR	.067	-.098***(-.139)
Intensity -> Bridging-SR	.051	.269***(.262)
Self-Efficacy -> Bonding-SR	.062	.156***(.178)
Self-Assertion -> Bonding-SR	.067	.224***(.255)
Social-Presence -> Bonding-SR	.085	.177***(.259)
Self-Esteem -> Bonding-SR	.066	-.023(-.030)
Intensity -> Bonding-SR	.049	.323***(.296)
Bridging -> Social Capital Effects	.037	.472***(.302)
Bonding -> Social Capital Effects	.041	.463***(.316)

*** $p < .05$, ** $p < .07$ (marginally significant)

Table 2 Results for Hypotheses

Hypothesis 1 was that, when using Facebook, the higher the self-efficacy, the stronger the bridging social relationships (H1-1) and bonding social relationships (H1-2). This hypothesis was supported, the results suggesting that self-efficacy is positively related to bridging and bonding social relationships. Both of these proposed paths were significant in the hypothesized direction (self-efficacy, with a standardized path coefficient for bridging and bonding social relationships: $\gamma = .093$, $p < .07$ for H1-1, marginally significant; $\gamma = .156$, $p < .05$ for

H1-2). Thus, both hypotheses H1-1 and H1-2 were supported.

Hypothesis 2 was that, when using Facebook, the higher the self-assertion the stronger the bridging social relationships (H2-1) and bonding social relationships (H2-2). Hypothesis was supported, the results suggesting that self-assertion is positively related to bridging and bonding social relationships. Both of the proposed paths were significant in the hypothesized direction (self-assertion, with a standardized path coefficient for bridging and bonding social relationships: $\gamma = .313$, $p < .05$ for H2-1; $\gamma = .224$, $p < .05$ for H2-2). Thus, both H2-1 and H2-2 were supported.

Hypothesis 3 was that, when using Facebook, the higher the social-presence the stronger the bridging social relationships (H3-1) and bonding social relationships (H3-2). Hypothesis 3 was supported, the results suggesting that social-presence is positively related to bridging and bonding social relationships. Both of the proposed paths were significant in the hypothesized direction (social-presence, with a standardized path coefficient for bridging and bonding social relationships: $\gamma = .177(.276)$, $p < .07$ for H3-1, marginally significant; $\gamma = .177(.259)$, $p < .05$ for H3-2). Confirmation of H3-1 was marginally significant, while confirmation of H3-2 was significant. Thus, both H3-1 and H3-2 were supported.

Hypothesis 4 was that, when using Facebook, the lower the self-esteem the stronger the bridging social relationships (H4-1) and bonding social relationships (H4-2). Hypothesis 4 was partly supported, the results suggesting that self-esteem is closely related to bridging social relationships but not to bonding social relationships. The proposed path for self-esteem to bridging relationships was significant in the hypothesized direction (self-esteem, with a standardized path coefficient for bridging and bonding social relationships: $\gamma = -.098$, $p < .05$ for H4-1; $\gamma = -.023$, $p > .05$ for H4-2). The relationship proposed in H4-1 was significant, while that proposed in H4-2 was not statistically significant. Thus, H4-1 was supported but H4-2 was not supported.

Hypothesis 5 was that, when using Facebook, the higher the intensity of Facebook use the stronger the bridging social relationships (H5-1) and bonding social relationships. Hypothesis 5 was supported, the results suggesting that intensity is positively related to bridging and bonding social relationships. Both of the proposed paths were significant in the hypothesized direction (intensity, with a standardized path coefficient for bridging and bonding social relationships: $\gamma = .269$, $p < .05$ for

H5-1; $\gamma = .323$, $p < .05$ for H5-2). Thus, both H5-1 and H5-2 were supported.

Hypothesis 6 was that, when using Facebook, bridging social relationships (H6-1) and bonding social relationships (H6-2) mediate the relationship between Facebook users' self-systems and social capital effects. The hypothesis was supported, the results suggesting that bridging and bonding social relationships are positively affected by social capital effects. Both of these proposed paths were significant in the hypothesized direction (bridging and bonding social relationships, with standardized path coefficients for social capital effects: $\beta = .472$, $p < .05$ for H6-1; $\beta = .463$, $p < .05$ for H6-2). Thus, both H6-1 and H6-2 were supported.

Conclusions and discussion

This study investigated the relationship between Facebook users' self-system component factors, social relationships, and social capital effects, using extant social capital theory and theoretical components of self-systems. The findings generally supported the hypotheses derived from the research model and previous empirical studies. This study also found that some elements of Facebook users' self-systems played a critical role in accounting for the formation and strength of bridging and bonding social relationships. The study also suggests that both types of social relationship are mediated when social capital effects are combined with self-systems.

To summarize the hypotheses tested in this study, self-efficacy had a positive influence on bridging and bonding social relationships, although the path coefficient of self-efficacy on bonding social relationships is higher than the corresponding path coefficient on bridging social relationships. Therefore, when using an SNS such as Facebook (the medium involved in this study), self-efficacy seems to play a more important role in bonding social relationships than in bridging social relationships. Users with a strong capacity for adopting new technology seek to form bonding relationships within their homogenous groups. They also exhibit trust and participate with greater commitment to such social groups.

Self-assertion plays a more critical role in bridging social relationships than in bonding social relationships where an SNS is involved. Users who are willing or eager to express their opinions about or share some knowledge about social issues sought to form bridging relationships with others through SNS use. Users with higher self-assertion tended to trust and feel intimacy with others when using an SNS than did users with lower self-assertion.

Social-presence is closely related to both bridging and bonding social relationships

through SNS use. Users who felt warmth and a sense kinship with others when using an SNS sought to form both bridging and bonding relationships. Users with strong social-presence were more willing to trust others and more likely to feel intimacy with others than were users with lower social-presence.

The study found a significant relationship between users' self-esteem and bridging social relationships but did not find a corresponding relationship regarding self-esteem and bonding social relationships. The results of this study are similar to those of Steinfeld et al. [1]. People with lower self-esteem are more positively engaged with bridging social capital than were those in the higher self-esteem group [1]. This study also found that users with lower self-esteem are more engaged with bridging social relationships than with bonding social relationships.

Intensity of Facebook use plays a more important role in bonding social relationships than in bridging social relationships. Users who tend to use an SNS frequently, especially when it becomes part of their daily routines, showed a willingness to form bridging social relationships.

Bridging social relationships are more closely related to social capital effects than are bonding social relationships. Both bridging and bonding social relationships mediated the relationship between self-systems and social capital effects. The stronger the bridging social relationship is the more effective is the social capital building. Users with strong bridging social relationships were more willing to trust others and participate in social organizations.

Implications and limitations

Facebook has become one of the most popular tools for social communication [53]. Several studies related to SNSs have been published. Steinfeld et al. pointed out that previous studies in this area have not focused on how technology can support the ability or motivations a person has for exchanging social capital [6]. Although the present study deals with the relationship between Facebook users' self-systems and social capital effects, individual differences among users, such as differences in personality or motivation, were not covered because individual difference variables play an influential role in determining how people respond to objects. SNSs have been developed by adding advanced features that recommend new connections to their users [54]. These advanced contents and tools help SNS users to connect more easily or to access to their extended networks through these sites.

The results of this study have important implications. The study examined how Facebook users' self-systems affect two types of social

relationships and social capital effects. The findings should establish baseline information on the relationship between users' self-systems and social capital by offering better understanding of such self-systems. The power of SNSs has already been established by previous studies, which have provided evidence that social change and new media user trends are driven by inter-relationships formed through SNS use and might be contributing to changes in interpersonal relationships, trust, and reciprocity.

MacKinnon terms a new identity that is created by communication through computers a *persona* [55]. A persona is in effect an artificial being that is formed by language and behaviors practiced by Internet users online. The literature on such personas has identified three levels of self-expression: First there are 'transparent figures,' individuals who express themselves as they are. These are contrasted with 'translucent figures,' individuals who reveal themselves only partially. Finally, there are 'opaque figures,' individuals who do not reflect themselves accurately at all when using an SNS. These variations among SNS users reflect differential desires to acquire goods online that users perceive themselves to be unable to acquire offline as well as dissatisfaction with themselves offline, which they can mask when behaving online. Therefore, much more work is needed to fully understand how SNS users compare their real offline selves with the ideal or artificial selves they sometimes create online. Such work should then be extended to investigate the role these differences play in building social capital through SNSs.

The limitations of this study include, for example, that fact that the study compared only five components of self-systems with social capital. Other external factors independent of self-systems should be examined to achieve a more comprehensive understanding of how SNS use affects bridging and bonding social relationships and social capital effects. For instance, a number of socio-cultural factors should be investigated.

This study determined the feedback and needs of SNS users by conducting a survey of general SNS users in a rapidly changing new media environment. This is such a dynamic environment that its findings could be rendered obsolete rather quickly. Furthermore, the study has not examined social networking sites as marketing communication channels. Therefore, future studies and methods must be devised with which to measure marketing communication over new technology channels. In addition, SNSs should be understood and discussed in light of deeper user behavior and motivations as they relate to SNS outcomes in future studies. Moreover, media users' perceptions of traditional

media should also be examined as functional aspects SNSs.

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HOW LONELINESS AFFECTS PROBLEMATIC FACEBOOK USE

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ABSTRACT

The main objective of this paper is to show how loneliness affects problematic Facebook use. We integrated the concept of loneliness in the advanced cognitive-behavioral model of generalized problematic Internet use and empirically tested the model with 200 Facebook users. Our findings suggested that loneliness predisposes individuals to the development of problematic Facebook use and confirmed that the preference for online social interaction and mood regulation predict deficient self-regulation of Facebook use and which in turn leads to negative outcomes.

Keywords: Problematic Facebook use, Deficient self-regulation, Preference for online social interaction, Loneliness, Psychosocial well-being

INTRODUCTION

As of 2011, there are more than 500,000,000 active Facebook users which equivalent to 1/13 of the entire population on earth. Half of them log in every day. 57% of users talk to people more online than they do in real life. Within just 20 minutes, there are 10,208,000 comments made, 2,716,000 photos uploaded, 2,716,000 messages sent, status updated and lots to mention.[17]

The proliferation of social networking site (SNS), Facebook, dramatically changes the way people communicate and their Internet using patterns. According to a survey entitled “Summer 10 Teen Lifestyle Report” conducted in September 2010 [49] with a total of 1,208 respondents of college-age, SNS was rated the top web destination among both male and female respondents for the first time, and they spent more than 10 hours a week using Facebook. As stated in the report, “Teens have caught the Facebook bug: In a word it would be dominance”.

Before the emergence of Facebook, past studies mostly focused on the problematic Internet use (PIU), its interaction with psychosocial well-beings and the related negative outcomes [3][5][15][20][21][22][23]. Research examining the relationship between PIU and psychosocial well-being can be categorized into three streams, one suggesting that utilization of Internet in communication has an overall positive effect on

psychosocial well-being [28][33][42], while the second one arguing that excessive Internet use will exert negative effects on one’s psychosocial well-being [35][55], and the third one contending that psychosocial problem is the cause rather than effect of addictive or problematic Internet use [9][31]. However, the lack of theoretical grounding [3][15][52][54], makes the available studies on relationships between Internet usages and psychosocial well-being ambiguous. Even in some highly publicized studies, researchers failed to replicate their earlier findings [12][25][29].

With the growing popularity of Facebook, we believe that issues over “problematic Facebook use” instead of “problematic Internet use” should deserve attention from psychologists and scholars in the new era. In addition, the interactive and social features embedded in Facebook [26][50] make it more addictive than other Internet-based technologies. Our review of prior studies on Facebook revealed that most existing Facebook-related studies tend to focus on its positive use [4][47], there are only very few studies examining the dark side of Facebook use, as well as how the use of Facebook related to psychosocial well-being. Thus, we believe that the current study will enrich the research of the negative use of social technologies and serve as an important foundation for future research.

As abundant research have shown that there are significant relationship between PIU and loneliness [34][36][39][40][46][48]. In the current study, we are particularly interested in how loneliness, a psychosocial well-being factor, affects problematic Facebook use. Concerning the role of loneliness, a psychosocial problem, as the distant cause of the problematic Facebook use is attainable owing to the robust theoretical groundings.

To bridge the gap of the prior literature on Facebook use, this study aims (1) to empirically test the advanced Generalized Problematic Internet Use model [10] in the context of Facebook, as well as (2) to examine the role of loneliness as the distant cause of the problematic Facebook use.

LITERATURE REVIEW

The current study draws on research from the literature on problematic use of information technology, interpersonal computer-mediated communication (CMC), social networking sites (i.e., Facebook) and the psychosocial well-being in both CMC and non-computer-mediated context. The theories presented in the current study demonstrate a high degree of relevance between the studies of problematic information technology use in social communication and psychosocial health. It accentuates the role of online social communication played in the relationships among PIU, its negative outcomes, and psychosocial health.

Prior Studies on Facebook

Facebook has gained huge popularity in the last few years. We have witnessed a significant number of studies of Facebook use in recent years. For example, Shi et al. [43] integrated expectation confirmation theory and identified factors that drive the continuance of Facebook usage. Nyland et al. [38] examined the five motives related to the use of SNSs, including meeting new friend, entertainment, relationships maintenance, social events, and media creation. Cheung and Lee [14] argued that Facebook usage is a collective behavior and used the three major social influence processes (subjective norm, group norm, and social identity) to explain we-intention to use Facebook. Our review of existing publications on Facebook revealed that researchers mostly focus on the positive use of Facebook; there is a lack of theoretical understanding of problematic Facebook use and its interaction with psychosocial well-being.

Problematic Internet Use

Over the years, researchers have explored problematic Internet use. Chen and colleagues [13] examined the possibility of the non-detrimental effects of Internet dependency and proposed an instrument to measure both positive and negative Internet dependency. Song et al. [45] identified new gratification factors specific to problematic Internet use. Young and Rodgers [57] investigated the effect of personality on the development of problematic Internet use.

Studies of problematic Internet use have initiated the line of problematic or dependent use of information technology which in turn built a strong foundation for future research.

Psychosocial Well-Being

Extant research examining the relationships between social communication and psychosocial

well-being, such as loneliness, offers robust support for the claim that individuals with psychosocial problems are less competent in interpersonal interaction. Psychosocially-ill individual are more likely to develop a preference for online social interaction, and which set a stage to the development of PIU. For example, a considerable number of scholars [39][40][46][48] suggested that loneliness exerts a significant effect on individuals' self-and-observer ratings of social competence and thus leads to the development of a preference for online social interaction. Shotton [44] and Davis [15] contended that the Internet itself does not make people isolated; rather, it is loneliness or other related psychosocial problems drives people to incline into online social communication in the first place.

As proposed in the psychosocial distress model of Davis [15], loneliness is treated as one of the distal antecedents to problematic Internet use. Morahan-Martin [36] also argued that lonely individuals perceive online communication as a way to mitigate the social anxiety encountered in traditional face-to-face communication, which makes them show greater preference for online social interaction.

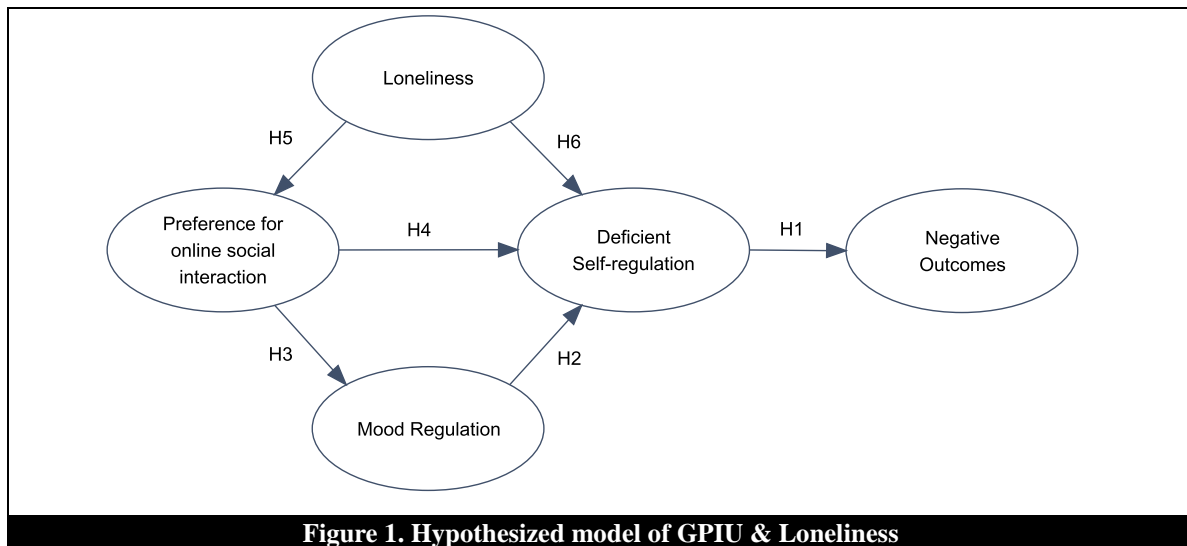
RESEARCH MODEL AND HYPOTHESES

In the current study, we borrowed and combined the cognitive-behavioral theory and psychosocial distress model from Davis [15] and the generalized problematic Internet use (GPIU) model from Caplan [10] in divulging the development of problematic Facebook use, and its interaction with loneliness.

The theory and research model advanced in the current study proposed the following: (a) loneliness predisposes individuals to the development of negative perception of their social competence; (b) these lonely individuals will then develop a preference for online social interaction as an alternative to traditional face-to-face communication as they perceive online social interaction to be easier, more comfortable and less threatening; (c) a preference for online social interaction and using online social interaction for mood regulation will lead to deficient self-regulation (i.e., compulsive use and cognitive preoccupation), which in turn, causes negative outcomes of Facebook use.

Key constructs in the research model

The model of generalized problematic Internet use (GPIU) is extended and the psychosocial health factor is included in the current investigation.



We borrowed the definition of problematic Internet use from Beard and Wolf [3] and defined the problematic Facebook use as the use of Facebook that creates social, school and/or work difficulties in a person's life.

Negative Outcomes

Negative outcomes refer to social and professional problems resulting from one's problematic Facebook use. Problematic Facebook use will exacerbate existing psychopathologies, and result in a vicious dysfunctional cycle. Davis [15] suggested that, problematic cognitions and behaviors intensify and accumulate over time, and continue to produce negative outcomes, resulting in a diminished sense of self-worth and increased social withdrawal. Suffered individual will lie about their use, and use Facebook to escape from problems in real life.

Deficient self-regulation

Deficient self-regulation is defined as a failure and state of inadequacy in monitoring one's use, judging one's use behaviors and adjusting one's use pattern [1][2]. Deficient self-regulation includes two higher-order constructs, cognitive preoccupation and compulsive use, which help in clarifying GPIU. Cognitive preoccupation is a status of obsessive thinking patterns engaging online activities. Shapira et al. [41] and Caplan and High [11] proposed a similar view on cognitive preoccupation and stated that there was a direct relationship among the cognitive preoccupation, problematic Internet usage and its associated negative outcomes. Deficient self-regulation also takes the form of compulsive use in the behavioral aspect [26][27]. Davis [15] argued that the cognitive and behavioral processes work together to develop negative consequences, and those cognitive and behavioral symptoms are

highly related to online activities featuring social interaction. Applying the model to the context of Facebook, users who become compulsive and obsessive in Facebook activities are most likely to result in negative outcomes, like missing classes, having troubles at work and deteriorating relationships with family and friends.

H1: Deficient self-regulation has a positive relationship with negative outcomes arising from one's Facebook use.

Mood regulation

Mood Regulation is defined as a process of mitigating one's anxiety encountered in interpersonal communications. Regulating mood by Internet use is one of the cognitive symptoms of GPIU as suggested by prior studies [6][9][31]. Caplan [6][9] argued that mood regulation served as an important cognitive predictor for negative consequences of Internet use, as he found out that people who were socially anxious showed greater preference for using the Internet to alleviate anxiety from face-to-face interactions. LaRose et al. [31] also emphasized that mood regulation takes a leading role in developing deficient self-regulation. In addition, Lee and Perry [32] claimed that using the Internet for mood regulation is one of the leading factors to deficient self-regulation.

H2: Using Facebook for mood regulation has a positive relationship with deficient self-regulation of Facebook use.

Preference for online social interaction (POSI)

Prior studies [7][8][9] showed that POSI is a cognitive individual-difference construct. The construct is characterized by the beliefs that one will feel safer, more efficient, more confident, and more relaxing when an individual is pursuing

online social interaction rather than face-to-face interaction. Building on the cognitive-behavioral theory [15], a considerable amount of researchers [7][8][26][27] have identified POSI as one of the important cognitive symptoms of GPIU. Researchers [8][26] has found that POSI also predicts the degree of compulsive use, one of the indicators of deficient self-regulation.

H3: Preference for online social interaction has a positive relationship with mood regulation.

H4: Preference for online social interaction has a positive relationship with deficient self-regulation of Facebook use.

Loneliness

There are extant research examining relationships between online social communication and psychosocial well-being. They offered robust support for the claim that individuals with psychosocial problems perceive themselves as incompetent in social communication. Self-perception of social incompetence leads lonely individuals to seek out what they perceive to be a safer and less threatening form of interaction as an alternative [39][40][46][48]. For instance, Prisbell [39] found that lonely individuals are incompetent in initiating face-to-face social activities and prefer online social interaction. McKenna and colleagues [34] contended that individuals suffering from loneliness prefer socializing online and can better express their real selves online.

In addition, the psychosocial distress model from Davis [15] stated that loneliness is one of the distal antecedents to problematic Internet use. Morahan-Martin [36] also contended that lonely individuals perceive online communication as a way to mitigate the social anxiety encountered in face-to-face communication, which make them show a greater preference for online social interaction.

H5: Loneliness has a positive relationship with preference for online social interaction

Caplan [7] acknowledged the association between psychosocial problems and deficient self-regulation. Similarly, Davis [15] indicated that loneliness acts as a distal cause of PIU as lonely individuals who are not successful in traditional face-to-face interaction will rely heavily on online social interaction. They treat it as a way to overcome or compensate their incompetence in interpersonal communication. Morahan-Martin [36][37], LaRose [31] and Shotton [44] supported the argument that psychosocial problems, like loneliness, would predispose individuals to the formation of preference for online social

interaction and set the stage for deficient self-regulation.

H6: Loneliness has a positive relationship with deficient self-regulation.

METHODOLOGY

Measures

The measures of the constructs in the current study are listed in Table 1(See Appendix). We adopted the Generalized Problematic Internet Use Scale 2 [10] in the current investigation. The scale has been continuously updated and well-validated. We also employed Russell's UCLA Loneliness scale in measuring loneliness. The 20-item scale is one of the most frequently employed instruments for measuring loneliness. All measures have been modified with the specific focus on Facebook and are measured in a seven-point Likert scale, from -4 = "strongly disagree" to 4 = "strongly agree".

Data Collection

A convenience sample of Facebook users was created by inviting volunteers through Facebook. Facebook users were chosen to be the subject of the study because they were believed to have developed different levels of knowledge related to Facebook use. Questionnaires were administered in an online surveying system, Qualtrics, and the URL of the online questionnaire was distributed through a Facebook event. The study was voluntary and an incentive of a voucher worth US\$15 was offered as a lucky draw prize to encourage more participation. A total of 200 questionnaires were collected. The sample size has met the recommended size [16][19]. Among the 200 respondents, 48% were male and 52% were female. About 87.5% were aged 16-25 and only 1.5% were aged 36 or above.

DATA ANALYSIS

The data analysis was performed in a holistic manner using Smart Partial Least Squares (SmartPLS), version 3. Following the two-step approach analytical procedures, the measurement model was first examined and then followed by the structural model [24]

Measurement Model

Convergent validity indicates the degree to which items of a scale that are theoretically related are also related in reality. It was examined by the use of composite reliability (CR) and average variance extracted (AVE). The critical values for CR and AVE are 0.70 and 0.50 respectively [18]. As shown in Table 2, all CR and AVE values fulfill the recommended levels, with CR ranging from

0.91 to 0.94 and the AVE ranging from 0.52 to 0.83.

Table 2. Psychometric table of measurements					
Construct	Item	Loading	t-value	Mean	S.D.
Deficient Self-regulation CR= 0.91 AVE = 0.63	DS1	0.80	26.40	3.71	1.73
	DS2	0.83	30.09	3.64	1.77
	DS3	0.62	11.50	3.65	1.63
	DS4	0.85	35.68	3.14	1.77
	DS5	0.77	21.45	3.68	1.83
	DS6	0.87	50.00	2.85	1.66
Mood Regulation CR= 0.91 AVE = 0.78	MR1	0.80	24.64	3.85	1.52
	MR2	0.93	85.63	3.84	1.63
	MR3	0.92	65.06	3.73	1.55
Negative Outcomes CR= 0.91 AVE = 0.78	NO1	0.87	35.91	3.13	1.77
	NO2	0.90	48.43	2.91	1.76
	NO3	0.89	50.26	2.61	1.73
POSI CR= 0.93 AVE = 0.83	POSI1	0.95	101.53	3.47	1.62
	POSI2	0.92	61.99	3.41	1.71
	POSI3	0.87	34.61	3.74	1.65
Loneliness CR= 0.94 AVE = 0.52	LONE1	0.73	15.14	3.07	1.18
	LONE2	0.75	21.81	3.65	2.13
	LONE3	0.76	20.16	3.64	1.91
	LONE5	0.78	22.02	3.43	1.68
	LONE6	0.62	10.36	3.67	1.76
	LONE7	0.71	15.56	4.55	1.94
	LONE8	0.72	20.09	4.38	1.93
	LONE10	0.72	16.10	3.96	1.88
	LONE11	0.79	26.19	3.76	1.85
	LONE12	0.79	28.72	4.35	2.13
	LONE13	0.71	17.40	4.42	2.02
	LONE14	0.79	26.36	4.04	2.10
	LONE15	0.61	9.88	4.15	1.85
	LONE16	0.71	14.91	3.31	1.85
	LONE18	0.72	20.24	4.74	2.08
	LONE19	0.68	12.29	3.45	1.80
	LONE20	0.72	16.43	3.27	1.85

Discriminant validity is the degree to which the measurement is different from other variables. It is indicated by low correlations between the measure of interest and the measure of other constructs [18]. Evidence of discriminant validity can be demonstrated when the squared root of AVE for each construct is higher than the correlations between it and all other constructs. As summarized in Table 3, the square root of AVE for each construct is greater than the correlations between them and all other constructs. The results suggest an adequate discriminant validity of all measurements.

Structural model

Figure 2 shows the overall explanatory power, estimated path coefficients (all significant paths are indicated with asterisks), and associated t-value of the paths of the research model.

Table 3. Correlations of constructs					
	DS	MR	NO	POSI	LONE
Deficient Self-Regulation	0.79 ***				
Mood Regulation	0.51***	0.88 ***			
Negative Outcomes	0.76***	0.48***	0.88 ***		
POSI	0.52***	0.58***	0.56***	0.91 ***	
Loneliness	0.42***	0.29***	0.55***	0.47***	0.72 ***

***p<0.01

Notes: Bolded diagonal elements are the squared root of AVE for each construct. Off-diagonal elements are the correlations between constructs

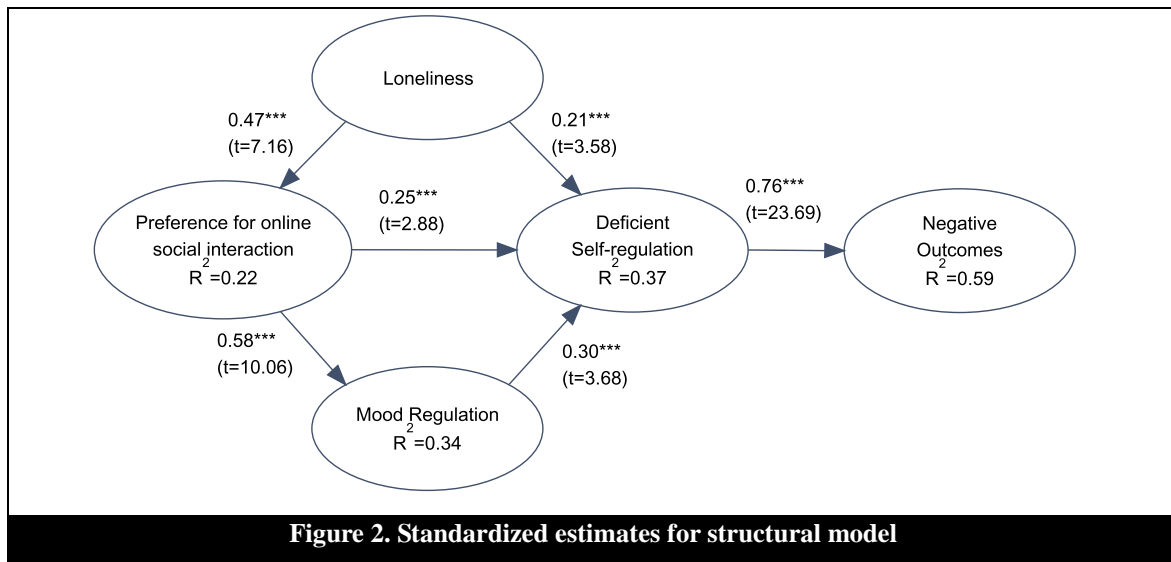
The results illustrate that the exogenous variables explain 59% of variation in Negative outcomes, 37% of variation in Deficient Self-regulation, 34% of variation in Mood regulation and 22% of variation in POSI. All the structural paths are found to be statistically significant in the research model and all hypotheses are supported. Deficient Self-regulation is found to be statistically significant to the Negative Outcomes, with path coefficient at 0.76($t=23.69$). POSI, Mood Regulation and Loneliness are found to have significant effects on Deficient Self-regulation, with path coefficients at 0.25($t=2.88$), 0.30($t=3.68$) and 0.21($t=3.58$) respectively. The POSI is found to have strong impact on Mood Regulation, with path coefficient at 0.58($t=10.06$). And finally Loneliness is found to be statistically significant to POSI, with path coefficient at 0.47($t=7.16$).

DISCUSSION AND CONCLUSIONS

The objectives of the current study are to empirically test the advanced Generalized Problematic Internet Use model [10] in the context of Facebook and to examine how psychosocial well-being factor like loneliness affects the problematic Facebook use. The research model is built on the cognitive-behavioral theory and the psychosocial distress model derived by Davis [15], and the generalized problematic Internet use (GPIU) model from Caplan [10]. The current study gives us further insight into the relationships among problematic Facebook use and its antecedents.

In this study, our measurement model is confirmed with adequate convergent validity and discriminant validity of all measures. The structural model also explains 56% of the variance in negative outcomes. All the hypotheses are statistically supported.

Our results show that loneliness has direct and significant influence to both POSI and deficient



self-regulation. It can be concluded that individuals suffering from loneliness find difficulties in both maintaining face-to-face social interactions and regulating their amount of Facebook use. Lonely individuals tend to rely heavily on online social interaction (Facebook) to compensate for their incompetence in face-to-face interaction and augmentation of troubles in real life. The dependence on online social interaction predisposes them to the development of problematic Facebook use and leads to negative outcomes.

Implication for Research

Research on problematic Facebook use and its relation to psychosocial well-being remains relatively new and receives only little attention from scholars. To enrich the understanding of the phenomenon, we proposed a research model and examined how loneliness affects problematic Facebook use. From the stimulus of the insights from this work, we would like to raise the research communities' awareness with respect to the following issues. First, the current study addresses an important and complicated area in user behaviors in Facebook and helps to validate the instruments for measuring problematic Facebook use. Facebook is widely recognized as one of the most popular platforms for online social interaction. A number of outstanding issues like problematic Facebook use or even Facebook addiction are still under-investigated. This research contributes to the empirical research of problematic Facebook use.

Second, the empirical study depicts the relative importance of antecedent factors for the development of problematic Facebook use and its resulting consequences. It is also one of first

research papers that incorporate the psychosocial well-being factors into the investigation of the problematic Facebook use. The paper helps to unfold the relationship between them and allow the future studies to base on this groundwork.

Implication for Practice

By including behavioral, cognitive and psychosocial well-being variables in the model, it is likely to give practitioners and educators knowledge for evaluating the degree to which users or students are developing problematic Facebook use. It is believed that the results of the study are helpful in providing substantial insights and guidelines for them, as well as any social network platform administrators, so as to create sustainable and healthy social networking environment. When notifying behavioral and/or cognitive symptoms of problematic Facebook use from users or students, they may offer with them some hints or advice as summarized in the following to tackle the misuse.

- A. Organize real-world socializing activities
- B. Give workshop for image and confidence building
- C. Provide counseling service to individuals with emotional need
- D. Set time-limit for each Facebook visiting
- E. Provide pop-up reminders to users about the time spent on the sites over a certain length of time
- F. Offer advice on maintain a balance living style

Limitations and Future Research

The reported results support the hypothesized model, but several limitations in the current methodologies deserve our attention. First, the current study relies heavily on the self-report data in operationalizing the GPIUS2 measures, and does not obtain and include objective measures

like direct observation and non-self-report data, which would in turn greatly enhances the validity and reliability of the measures.

The second limitation of the current study relates to the sample. Though there are participants over 35 years old, the predominant groups of participants are aged 16-25. A sample comprised mostly of students was used for the reason that students are frequent and heavy Facebook users. Any study aiming at investigating the problematic uses, however, should include frequent users of the media rather than simply students.

GPIU have been extensively studied and advanced. Much work, however, is still to be done.

Regarding the advanced GPIU2 model, continuous studies are required to further assess its validity and reliability. For instance, researchers can conduct test-retest for assessing the reliability of the measurements. Data can be collected from diverse or specific groups of respondents to evaluate the model fit of measurements.

Finally, future studies should consider including other types of psychosocial well-being constructs (e.g., Depression, Self-esteem and Shyness) as to produce a more thorough picture and to further improve our understanding of the formation of the problematic use of Facebook and its interaction with other psychosocial well-being factors.

APPENDIX

Table 1. The generalized problematic Internet use scales 2			
Subscales	Item	Item Wording	Source
Deficient Self-Regulation	DS1	I want to, or have made unsuccessful efforts to, cut down or control my use of Facebook	Caplan (2010)
	DS2	I have attempted to spend less time on Facebook but have not been able to	
	DS3	I have tried to stop using Facebook for long periods of time.	
	DS4	I am preoccupied with Facebook if I cannot log on for some time	
	DS5	When not on Facebook, I wonder what is happening there	
	DS6	I feel lost of can't go Facebook	
Mood Regulation	MR1	I have used Facebook to talk with others when I was feeling isolated	
	MR2	I use Facebook to make myself feel better when I'm down	
	MR3	I have gone Facebook to make myself feel better when I was down or anxious	
Negative Outcomes	NO1	I have gotten into trouble with my employer or school because of visiting Facebook	
	NO2	I have missed classes or work because of visiting Facebook	
	NO3	I have missed social engagements because of visiting Facebook	
Preference for online social interaction	POS11	I am treated better on Facebook relationships than in my face-to-face relationships	
	POS12	I am more confident socializing on Facebook than I am offline	
	POS13	I am more comfortable with Facebook than people	
Loneliness	LONE1	I feel in tune with the people around me ^a	Russell (1980)
	LONE2	I lack companionship	
	LONE3	There is no one I can turn to	
	LONE4	I do not feel alone ^a	
	LONE5	I feel part of a group of friends ^a	
	LONE6	I have a lot in common with people around me ^a	
	LONE7	I am no longer close to anyone	
	LONE8	My interests and ideas are not shared by those around me	
	LONE9	I am an outgoing person ^a	
	LONE10	There are people I feel close to ^a	
	LONE11	I feel left out	
	LONE12	My social relationships are superficial	
	LONE13	No one really knows me well	
	LONE14	I feel isolated from others	
	LONE15	I can find companionship when I want it ^a	
	LONE16	There are people who really understand me ^a	
	LONE17	I am unhappy being so withdrawn	
	LONE18	People are around me but not with me	
	LONE19	There are people I can talk to ^a	
	LONE20	There are people I can turn to ^a	

^aItem should be reversed (i.e., 1=7, 2=6, 3=5, 4=4, 5=3, 6=2, 7=1) before scoring

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A STUDY ON MOBILE BUSINESS THROUGH SOCIAL MEDIA

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ABSTRACT

With the increasing use of mobile information systems, mobile devices find its utility growing gradually for business processes. Equally there has been considerable growth of business opportunities over social media provides a win-win situation for both users and business people. Therefore it is also necessary to pay more attention to mobile business processes and social media methods for such systems. One way of analyzing importance of business process over social media is through mobile services acceptance model. In this paper we analyze mobile business process through social media using mobile services acceptance model as presented by Gao et al. and taxonomy of mobility-related requirements that enhances the business processes through recent portable devices. This study indicates basic requirements for Mobile business especially that fits through social media.

Keywords

Mobile business, Social Media, Requirements, Mobile services acceptance model, Mobile information systems

1 Introduction

In the modern world, because of the advancement in Information and Communication technology (ICT) the connectivity between the people are improved and get to know about individual statuses so much because of social networks. This connectivity becomes possible anytime, anywhere through portable mobile devices[1,

2]. The end users already started ubiquitously do business purchase and their needs without physically present at particular time. For example, personal visit is not necessary anymore for any bank transfer of money or avail additional services once you have the account already. Now, it is even simpler than earlier with mobile banking or banking using smart phones etc. Earlier ICT was used to broadcast information, i.e., used to update the status like confirmation of purchase, booking normally an SMS sent to mobile devices and most of the business activities done through traditional information systems like standard PC. From the advent of wireless computing technology and continuous introduction of new devices introduced new business opportunities over it. With the price reduction of mobile devices over time and availability of internet services connectivity anytime anywhere social network connectivity, a new era of business opportunities open for small firms to large ones without investing much for their business. Mobility is the particular distinguishing characteristics with mobile business process and now being available with social network on mobile become state of the art characteristics of common end user[3]. In this paper we propose following research questions;

RQ1. How Mobile business application through social media different from other mobile service application?

RQ2. What are the additional factors that governing the adapted mobile service acceptance model that suit for mobile business application through social media?

The rest of the paper is structured as follows: Section 2 reviews the background and related work and section 3 discusses adaptations required in mobile service acceptance model. Section 4 concludes the paper.

2 Background and Related Work

The traditional e-business and mobile business are basically needed completely different working environments and has different set of requirements[4]. The traditional users perform their business operations over well-known environment (technologies, information, documents and people) in using traditional information devices, but for the mobile workers[5], even though the mobile portable devices are familiar with business people now but yet it is not comparable with traditional systems for their business purpose. In recent times surveys found that social networks updates are getting day today activity of most of the people around the world. In Table 1, the popular social networks available with their user count are provided and it still increasing. The growth of the social networks as shown in

fig.1, become unstoppable and thus every business firm started thinking how to utilize social networks for their growth as win-win-win situation for the business firms, social networks and the end users. Because of the minimum resource required through social networks for any firm than the usual way, even smaller firms started utilizing for them customer support purposes that increases again the user count to great peak (shown in fig. 2). Gao et al produced mobile service acceptance model which developed for mobile service applications but that lags in certain aspects for applications that are developed for social networks and utilized in mobile devices[6, 7]. The mobility related requirements provide detailed requirements set and templates for any application that need to be developed over mobility as a main concern[8, 9]. The importance of non-functional requirements and its management in modeling domain are discussed in the work by pavlovski[10]. The way for utilizing mobile business to increase the value for firms are discussed by picoto et al[11].

Table 1. Social Network Stats for the Week 30 Sept 2011[12]

Facebook:	over 800 million users	via Facebook
Twitter:	over 200 million users	via ReadWriteWeb
Renren:	over 170 million users	via iResearch iUser Tracker
Qzone:	480 million users	via Wikipedia
Sina Weibo:	over 140 million users	via SINA Corporation
LinkedIn:	115 million members	via LinkedIn
Groupon:	115 million subscribers	via Reuters
Google Plus:	43 million users	via Mashable
Tumblr:	30 million blogs	via Tumblr
Foursquare:	14 million users	via Foursquare

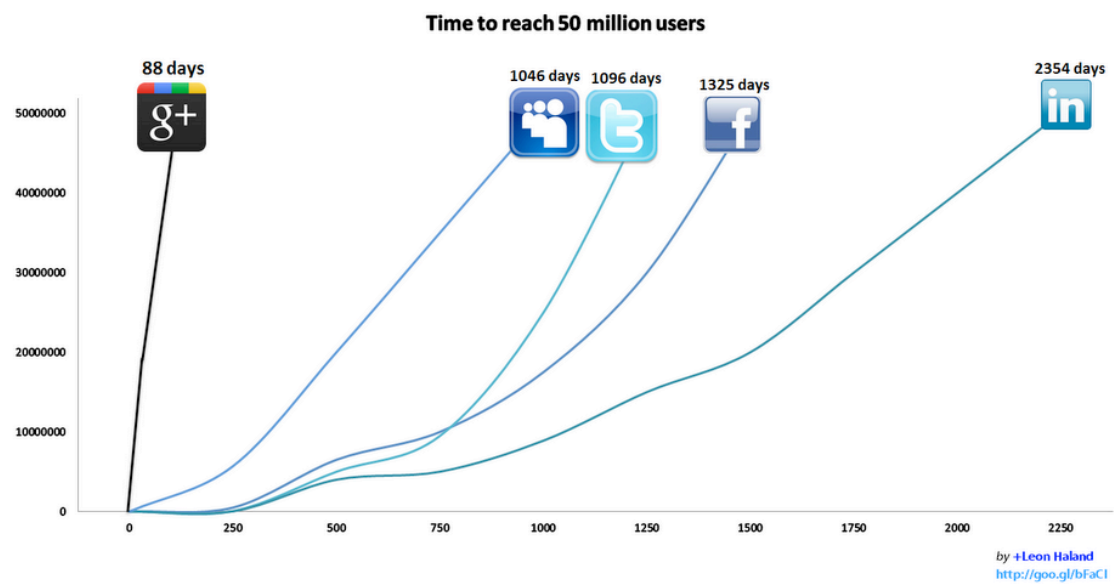


Fig. 1 Social media growth with time period[13]

Most Popular Websites in Computers and Internet - Social Networking and Forums ranked by Visits Share
Week ending September 24, 2011

	Websites (5,092 returned)	Total Visits	Visits Share ▼	Rank 09/17	Rank 09/10	Rank 09/03
1	Facebook	1,758,098,904	64.85%	1	1	1
2	YouTube	530,106,957	19.55%	2	2	2
3	Twitter	33,081,730	1.22%	3	3	3
4	Yahoo! Answers	28,011,794	1.03%	4	4	4
5	Tagged	19,664,368	0.73%	5	5	5
6	LinkedIn	17,804,114	0.66%	6	7	7
7	MySpace	16,333,114	0.60%	7	6	6
8	Google+	14,977,469	0.55%	54	49	52
9	myYearbook	10,581,147	0.39%	9	9	9
10	iVillage	10,342,871	0.38%	8	8	8

Fig. 2 Social network visitors count[14]

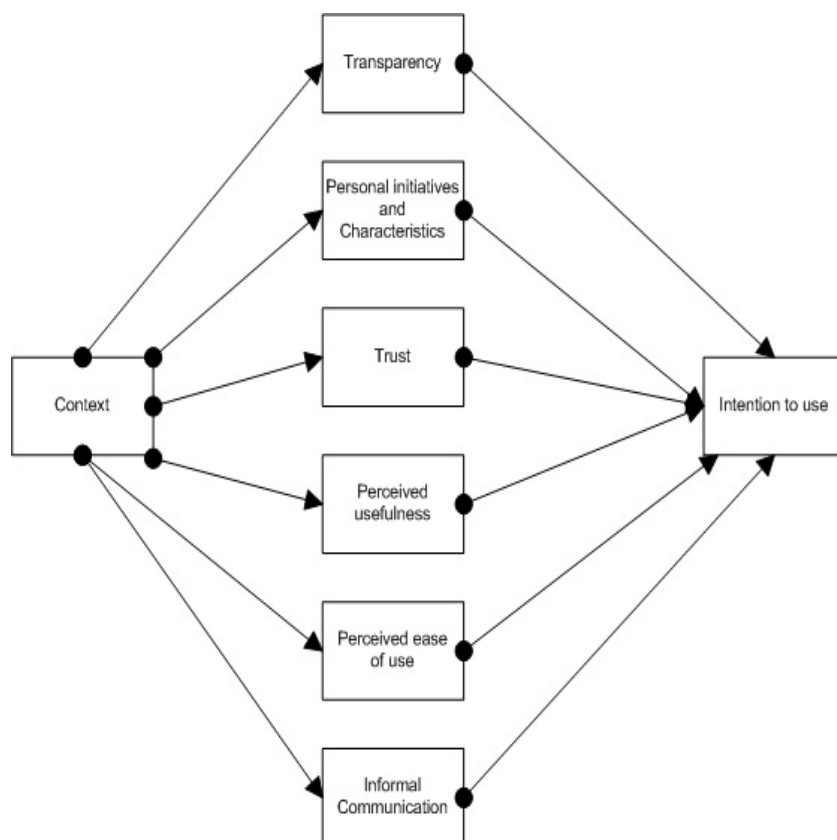


Fig. 2 Adapted Mobile Service acceptance model for mobile business

3 Adapted Mobile Services Acceptance Model

Acceptance model are available with different targets in providing certain criteria to fulfill the need of the systems. All these acceptance models are based on the TAM model and will be adapted to support certain particular systems. For example Gao et al provided earlier on mobile services acceptance model. As discussed earlier section this model target mobile commerce applications to follow this model. But we adapted this mobile service acceptance model augmented with factors transparency and informal communication with already available factors like personal initiatives and characteristics, trust, perceived usefulness, perceived ease of use, context and intention to use. This adaptation is provided to suit the concept of mobile business through social media. The detailed description of these factors explained as follows.

Context

Context provides the detailed information about the domain including location, the business activity and end users info. As per

Greenberg define context as a dynamic construct[15], i.e. any information that can be used to characterize the situation of entities (i.e. whether a person, place, or object) that are considered relevant to the interaction between a user and an application, including the user and the application themselves[6, 15]. Mobile business social media application context should provide information on location, identity, the state of the people (walking, travelling in car/train/bus, at airport, ...etc.), mobile device details (computing devices and objects). Mobile acceptance model classifies the context into two categories viz. place and people centered context. In our analysis we keep this two are valid and emphasizing mobility over these two and always denotes the mobile context. i.e. Mobile business applications that are using the social media as their context should always support mobility requirements.

Transparency

Transparency is one of the distinguished factors with mobile service acceptance model. Mobile business application in social media should be able to provide transparent services to the users but the user can opt for their business activities kept invisible to

others. The openness of the business activity with immediate feedback for customers is the advantages of transparent nature of social media. Due to anywhere connectivity concepts of mobile devices, bidding concepts also worked well with mobile business especially through social media.

Personal initiatives and characteristics

Personal initiatives and characteristics are different with individuals. This differs from people to people depending their educational background, gender, age, interest to learn and practice new things. But as far as social media concern, it already won all the age group irrespective of gender and there may little bit difference in using social networks with mobile devices. So this factor could affect the mobile business over social media. The attitude of using social network for other than business purpose will be less risky with mobile devices for example, interrupted transaction due to poor connectivity will be certainly affect the personal initiatives and characteristics of the user.

Trust

For any business application and activity, trust is the key factor. The user should believe and put faith on the specific business application or activity should provide enough safety and security for their transaction or usage[16]. It is indeed a key factor with mobile business especially that is openly available through social networks. In a social network keeping a user trustable with any business application means a lot with business opportunities. i.e. friends and family members following the user will started believing and trust the business application which is the power of social networks.

Perceived usefulness (PU)

Perceived usefulness is defined as the degree to which a person believes that using a particular system, i.e. mobile business through social media would enhance his or her task. It is evident that mobile services confirms the anywhere connectivity and the user almost available anytime through social networks, and hence perceived usefulness for both user and business firms are significant. TAM model also suggest that PU has direct positive effect on users' intention to use.

Perceived ease of use (PEOU)

PEOU is defined as the extent to which a person believes that using a particular system would be free from effort. PEOU mainly deals to what extent the usage of mobile business over social networks beneficial without difficulties. This also influenced by the context where the user, business application being utilized. As per Davis et al, PEOU has positive effect with users' intention to use.

Informal communication

Informal communication is very important for business domain with end user directly. Informal communication defined to be with or without particular intention, knowing in and around happenings and sharing this knowledge with everyone along with updating ones own. Social networks now becoming business dominant than earlier since the users are borderless connected. The users mostly, like minded or with same demands and cultural people are of same interest which is easy for the business people target their users from their beta version ideas. The informal communication enhances both the customers demand and provides business firms quick feedback before firms official launch of the product. Through social network on mobile devices the ability of getting feedback and support after business activity became available anytime which is the primary factor for intention to use.

Intention to use

Intention to use is the intention of people to use the mobile business applications over social media. This is influenced by the above variable factors context, transparency, trust, perceived usefulness, perceived ease of use, informal communication and characteristics.

4 Conclusions and Future Work

Social networking software application development is taking place heavily in almost every organization now. Through above discussion we have shown that certainly mobile business application through social media is different from other mobile service application and suggested the adapted mobile service acceptance model to answer RQ2. In this paper we provide a checklist for the developers who develop the software applications for social network must consider this adapted mobile service

acceptance model in development stage itself. By following this acceptance model, the development team can provide software application that can fit for especially the mobile business. These suggested adapted mobile service acceptance model however not evaluated so far. As a future work on evaluation, we planned to conduct an experiment with a case study on mobile application in social media to confirm the validity of our adapted mobility acceptance model.

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VIDEO GAMES: OPPORTUNITIES FOR INFORMATION SYSTEMS & TECHNOLOGY ENROLLMENT

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ABSTRACT

Enrollment in information systems and related fields has been on the decline for over a decade. At the same time, video games are increasing in popularity, especially with undergraduates. Departments at 222 American schools offering video game related undergraduate degrees were analyzed to determine which academic fields have integrated games into their curricula. A majority of the programs were offered either by art / design departments or computing departments, with only one program hosted by a business school. Opportunities still exist within information systems and technology programs to incorporate video games as part of their curriculum.

Keywords: video games, IS education, IT education, CIS education

INTRODUCTION

Video games are ubiquitous in North America. Recent studies by the Pew Internet & American Life Project estimate that 97% of teens and 53% of adults play video games [7] [6]. The average video game player is estimated to be in their mid-thirties [6] [5]. It is not only men and boys who play video games. Fifty percent of adult women play video games [6], and more than twice as many women play video games than boys under the age of 18 [5]. Alongside the rise in social media and the proliferation of devices, gaming has become even more accessible within Facebook and on mobile phones. Social games company Zynga, creator of Farmville, boasts 60 million daily and 232 million monthly users [11]. The massively multiplayer online game World of Warcraft had 12 million subscribers in 2010 [2].

The video game market shows no signs of waning. U.S. video game sales in 2010 represented \$15.9 billion on software, for a total of \$25.1 billion when hardware and accessories are included [5]. In 2010, an estimated 120,000 jobs in the United States rely on game software, including 32,000 directly by the video game publishers [10].

In *Reality is Broken*, McGonigal argues that we should look to game design to transform work and other tasks into more

pleasurable experiences [9]. Today's video games are complex information systems. The overwhelming majority of undergraduate students are familiar with and play them. Is it possible that students' enjoyment of video games could be used as a gateway into interest in CS, IS, and IT fields?

CURRENT ACADEMIC DISCIPLINES RELATED TO VIDEO GAMES

Art, Design, Digital Media Studies

One type of video game degree program focuses upon the artistic aspects of games, including 2D and 3D animation, character modeling, texturing, and audio generation. Many of the tools and techniques used to create art for advertising, film, and fine art can also be used to generate assets for the video game industry.

Media studies, communication, and related programs offer their own style of degree, typically focusing on the analysis and generation of game narratives. These degrees apply existing theories from the fields of print, film, and journalism and extend them to cover video games. Programs often involve the creation of a "game design document", which may include information on the characters, story, gameplay, level design, and some artistic assets.

Computer Science

A third type of video game degree is offered from the computer science (CS) perspective. Video games are played on computers and/or custom hardware such as consoles. For many students, CS is the department for anything related to computing. Computing degrees vary in their treatment of video games, with some delving into the development of game engines, others looking at graphics and physics, or focusing on modifying existing games and using game development frameworks.

Information Systems and Technology

The diffusion and diversification of information systems and technology has led to a widening of needs and expectations.

Although CS and engineering are at the heart of video game hardware and game development, there are still many positions outside of development, within video game companies that require a familiarity with technology, but not the depth that a CS degree requires.

Management strategies Information Systems (IS) and Information Technology (IT) schools teach concerning software development could easily be extended to cases involving video games. For example, waterfall project management methodology and plans measured in years do not always meet the needs of digital agencies or prototype developers. Agile development methodologies and related project planning may be combined with plan-based to provide more effective development [1].

TRENDS IN ENROLLMENT AND GAME CURRICULA

Decreasing enrollment in CS, IS, IT, and Computer Information Systems (CIS), has been a problem for over a decade. Enrollment in computing degrees declined 32% between 2000 and 2004 [8], and although the number of undergraduate computing degrees awarded in 2010 increased from 2009, this was the first annual increase after a long decline, according to the Taulbee Survey [3]. The gender gap is still present, with women accounting for only 13.8% of bachelor's graduates in CS in 2010 [3].

Art/Design/Media Studies, Computer Science, and Business/Information Systems/Technology are academic fields related to video games. To what extent are these three fields already offering video game related education at the university level? What academic disciplines are offering video game related degrees? Is the market already saturated, or is there additional opportunity to introduce video games into certain curricula?

METHODS

The Entertainment Software Association (ESA) is an American association of video game publishers and developers. The ESA also maintains a list of U.S. colleges and universities that offer video game courses and degrees. Using the list provided on their website [4], a list of all schools, the level of degree(s) and/or certificate available, and their location was recorded. Since the list included a wide range of educational institutions, such as technical schools, community colleges, and universities, the list was narrowed to include only those offering Baccalaureate degrees. This eliminated those schools only offering a

single class related to games, as well as non-traditional schools with brief offerings such as 3-day courses.

We visited each school's website and made note of the department(s) offering the video game related degree. If the home department was not specified or was too broad, such as Arts and Technology, the degree's course sequence and course descriptions were reviewed to categorize the program. If the home department did not fit within one of the previously described academic fields, the name of the department was noted. For those degrees that represented a collaboration between disciplines or that offered concentrations hosted by diverse departments, each department was noted.

RESULTS & DISCUSSION

The initial list included 223 schools, but one school was removed because no information about its curriculum or host department could be found. The majority of the programs were hosted by either an art /design department or a computing department (*Table 1*).

Table 1 - Primary discipline offering video game degree; degrees with cross-departmental collaboration and/or concentrations are represented within each primary discipline.

Primary Discipline	# of Schools
Art / Design / Digital Media Studies	125
Computing	105
Business	1
IT	3
Other	3
	<i>Computer Engineering; Computer Graphics; Electrical and Computer Engineering</i>
Hybrid Departments	3
	<i>Technology & Digital Media; Telecommunications, Information Studies and Media; CIT and Graphics</i>

Six schools had departments that were difficult to classify, for two reasons. Three departments have foci different from computer science, two in engineering and one specifically in computer graphics. The remaining three schools had departments that span across both art/design and computing, such as "Computer Information Technology and Graphics".

Only one business department offers a game-related Bachelor's degree: Interactive Games Management (BBA) at St. Edward's University in Texas. Three programs offer degrees in Technology or Information Technology departments, but their curricula do not require core business courses. No Information Systems departments host video game related degrees. Since video games can be complex information systems, it is surprising that so few IS and IT schools house video game-related degrees.

Table 2 - Geographical distribution of video game programs within the United States, by state.

State	Programs within the State
California	41
Illinois	16
Florida	15
Minnesota, Texas	12
Massachusetts, Michigan	10
New York	9
Colorado, Georgia	8
Pennsylvania	7
Indiana, Wisconsin	6
Maryland, Utah, Virginia	5
Arizona, Ohio	4
Missouri, North Carolina, Washington	3
Iowa, Louisiana, New Hampshire, New Jersey, Nevada, Oklahoma	2
Alabama, Connecticut, Washington DC, Delaware, Hawaii, Idaho, Kansas, Kentucky, Montana, North Dakota, Nebraska, New Mexico, Oregon, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont	1
<i>Total within United States</i>	<i>222</i>

The geographical distribution of programs within the United States does not follow population distribution or location of game development studios (Table 2). California has 41 of the 222 total programs, but popular game development industry locations like Washington have only 3 programs. Six states do not have any video game degree programs listed with the ESA.

CONCLUSIONS

One of the limitations of this research is that the accreditation of the programs was not considered. Within the United States, post-secondary programs may be regionally accredited, nationally accredited, or offered without accreditation. This affects whether students are eligible for student loans, but also can be used as a metric of rigor and academic value. Future work could further segment the data into regional, national, and not accredited programs for additional detail.

A second limitation is that only American schools are examined. The video game industry originated in the United States and its current employment is only rivaled by Japan. Future work could look at international programs, though validating a comprehensive list could be challenging.

The video game industry continues to expand its market and present emergent challenges for those working in all aspects of the industry. Despite the large number of schools offering video game related degrees, American information systems schools have not expanded their degree offerings. Games are complex, distributed information systems that most undergraduates are already familiar with. The inclusion of video games within traditional curricula may act as a gateway to better prepare those students moving into the video game and digital media industry.

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STUDENT EVALUATION OF A DIGITAL LEARNING GAME

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ABSTRACT

Data from 294 post-graduate students studying business administration were analysed to determine perceptions toward digital learning games. This research can be used as a conceptual model of how to react to new methods of instruction. 25 subject (game) related and 21 tutor related attributes made up the course evaluation form. Preliminary findings suggest a Halo effect in form of student's perception of the tutor being influenced by the subject, vice versa. Although the overall evaluation of both, game and tutor, were on average very positive, there were distinct differences between clusters.

Keywords: e-learning, games, business simulation, online assessment.

INTRODUCTION

Digital Learning Games

Digital learning games recreate a situation to solve problems or gain insights [1] in order to facilitate problem-solving, critical thinking, and social skills [2]. Digital learning games are in line with the theory of constructivism [3] and need to be fast, active, and exploratory [4]. Complex games such as Markstrat [5] require time to understand. The advantages of complex games are: motivation of students [6], improvement of attitudes [7], engagement [8], appeal to a wide audience [9], and enhancement of learning outcomes [10]. In summary, digital learning games contribute to better thinking skills [11].

Research Questions and Methodology

Ten business simulation courses at a Singaporean university were analysed. The authors employed a mixed methods research design [12] by analysing quantitative data as well as explicit comments by 294 students posted onto discussion boards (DB). These post-graduate executive MBA students learnt the game on their own, and completed a survey after the game. Markstrat, a strategy based game, was played during a 12 weeks course. Students had to rate subject (game) related as well as tutor related attributes.

Subject related questions:

- Organisation
- Content and Workload
- Assessment
- Usability

Tutor related questions:

- Personality
- Facilitation
- Quality of Feedback

The research questions were:

1. How do students evaluate an educational simulation game and the tutor?
2. Is there a correlation between subject (game) and tutor evaluation i.e. a Halo effect?
3. In this context, what are major dimensions that students look at?
4. Do specific groups differ in their evaluation and level of activity?

Findings

Students anticipated that the game will be interesting. Although the entire course was taught online and students do not physically meet each other, the word spread and created some excitement:

DB Posting: *"I have heard that this game is quite interesting so looking forward to a great learning."*

Required reading material, the handbook, covered 76 pages, slowed down the game, and caused some frustration.

DB Posting: *I have a problem with understanding this Markstrat. I went all over in the Markstrat program and I don't have a clue of what to do. I'm really struggling to get into the game. Anyone can enlighten me?*

However, the game propelled the laggards to learn more as they played 'catch-up.' Students experienced cognitively complex yet realistic situations which they had to solve as team. At the final evaluation, results were very positive, see Table 1.

Table 1: Game Evaluation

	N	Mean	Std. Deviation
S_A5	294	4.37	.776
S_B4	294	4.41	.674
S_B6	294	4.29	.864
S_C1	294	4.41	.680
Valid N	294		

Students' assessment whether 'peer interaction in this subject contributed to my learning' (see Table 1, S_A5) was a 4.37 on a 1 (totally disagree) to 5 (totally agree) Likert scale. Students want materials that directly connect to their learning needs [13]. During the game a

number of readings were given to students such as journal articles. Students were asked whether ‘the game was appropriately linked to third party content (e.g. readings)’ see Table 1, S_B4. The answer was a very encouraging 4.41. The class schedule and game management are concerns that can interfere with widespread use of simulation gaming [14]. The question whether ‘the workload was appropriate for a reputable MBA program’ Table 1, S_B6, was given a 4.29. Some games promote learning, but are not enjoyable to play, others are fun but trigger no thoughts. The question whether ‘the game was thought-provoking and challenging’ got a 4.41 (Table 1 S_C1).

Students got better at playing the game through the total of 12 rounds. Most of them rated themselves positively in areas of self-efficacy and game leadership. After the second round, they believed they could lead game as team leader. Some students commented on their learning outcome.

DB Posting: *It was indeed fun to play and personally I have got sufficient clarity on markets, segments, consumer prefs, internal capabilities of the firm to serve them and allocate scarce resource to gain higher profitability.*

Facilitating a game asks teachers to move from the role of providing information to a constructivist model of instruction. “Students are active learners who construct, interpret, and reconstruct rather than simply absorb knowledge” [15]. Setting a constructive and helpful tone by the tutor is essential [16].

Table 2: Evaluation of Teacher

	N	Mean	Std. Deviation
T_A2	294	4.54	.699
T_A3	294	4.53	.733
T_A5	294	4.53	.694
Valid N	294		

Students were asked whether ‘the professor was enthusiastic’ (see Table 2, T_A2), ‘helpful’ (T_A3), and ‘well organised’ (T_A5).

Table 3: Overall Ratings (sig. at 0.01 level)

	S E1	T D1	T E1
Correlation	1.000	.882	.876
S E1			
T D1	.882	1.000	.946
T E1	.876	.946	1.000

On average, the game was extremely well received. There seems to be some interdependence between subject (S) and tutor (T). Students who liked the game, gave the tutor a high overall grade, vice versa, see Appendix and

Table 3. The next question was whether there are some major dimensions that students look at. For this purpose a factor analysis was conducted.

Table 4: Rotated (Varimax) Factor Loadings

	Factor 1	Factor 2
T_A5	0.839	
T_A3	0.838	
T_A2	0.820	
T_A4	0.807	
S_C2		0.840
S_C7		0.835
S_C6		0.824

The factor analysis resulted in 2 factors explaining 87.1% of variance. Both factors contributed roughly the same (43.8% & 43.3%). Considering loadings above 0.8 we get a tutor personality dimension (factor 1) and a subject assessment dimension (factor 2); variables see appendix. The only personality attribute that is not included is the tutor’s knowledge which may be a consequence of the game’s team character and less focus on the teacher.

With 7 high loading variables of table 4 a cluster analysis was conducted, see Table 5.

Table 5: Evaluation Cluster Centroids

	T_A2	T_A3	T_A4	T_A5	S_C2	S_C6	S_C7
	Mean	Mean	Mean	Mean	Mean	Mean	Mean
C 1	2.96	2.78	3.04	2.96	2.57	2.83	3.00
2	4.02	4.01	4.05	3.96	3.86	3.89	3.86
3	4.86	4.89	4.98	4.89	4.02	4.09	4.00
4	4.99	5.00	5.00	5.00	4.94	4.92	5.00
M	4.54	4.53	4.57	4.53	4.31	4.34	4.37

There are 4 distinct clusters. Cluster 1 (N: 23) may be described as not enthusiastic about the subject as well as tutor. Cluster 2 (N: 83) more positive; expectation are met but not exceeded. Clusters 3 (N: 44) and Cluster 4 (N: 144) are very positive. Again, this result shows that there is a Halo effect in the form that student’s perception of the tutor is influenced by the subject, vice versa. Unfortunately it is not possible to analyse the profile of Clusters 1 and 4 further because student’s evaluations were submitted anonymous out of fear that a tutor may penalise a specific person for poor feed-back. Although it is impossible to make a direct link between a person’s course evaluation and actual online activity it is possible to analyse the latter, see Table 6.

Table 6: Online activity

	N	Min	Max	Mean
Sessions	294	2	528	130.09
Total Time	294	0:01	8:19	1:53
Mail_Read	282	1	379	59.93
Mail_Sent	239	1	88	8.96
DB_Read	294	3	17290	6053.29
DB_Post	294	0	524	76.67
Chat	82	1	69	7.49
Organizer	294	13	739	192.16
N	294			

The minimum number of total logins during the 12 rounds of the game was 2 i.e. this particular student did not retrieve all game results nor participated in team discussions. The minimum time spent online on the game per day stood at 1 minute, the longest 8 hours and 19 min. There are equally huge differences between incoming emails read, emails sent out to others, discussion board postings read and posted as well as participating in chats and viewing the organiser (tool for tracking assignments, game deadlines etc). The high number of DB_Read is a result of around 3,000 postings per course i.e. each person reads on average each posting twice. In a similar pattern as the evaluations have been analysed, the factor analysis shows two factors, see Table 7.

Table 7: Activity Factors

	Factor	
	1	2
Sessions	.918	-.119
Organizer	.773	-.197
DB_Read	.760	.072
Total Time	.655	-.352
DB_Posted	.638	-.336
Mail_Read	.321	.727
Mail_Sent	.565	.685
Chat	.049	.634

Factor 1 shows high loadings of number of sessions, organiser viewed and DB postings read whereas factor 2 shows a mail dimension. A cluster analysis, see Table 8, resulted in four clusters.

Table 8: Activity Cluster Centroids

	Session s	Organize r	DB_Read	Mail_Read	Mail_Sent
	Mean	Mean	Mean	Mean	Mean
Cluster 1	272.44	331.78	57964.6	165.89	38.33

2	116.35	176.75	3627.06	103.73	14.29
3	187.52	279.01	7329.58	51.51	7.54
4	76.69	115.57	1493.65	34.37	4.65
M	130.09	192.16	6053.29	59.93	8.96

Cluster 4 shows the lowest and cluster 1 the highest level of activity. Unfortunately it is not possible to match these 4 activity based clusters with the 4 evaluation clusters due to data protection of students. We may hypothesise that there is a strong correlation between the cluster 4 of table 8 and cluster 1 of table 5. Students who do not like the subject including tutor may be the least active, vice versa. However, this analysis has shown again that there are distinct differences between groups of students.

Conclusion

A logical choice for tutors, who want to make their instruction interactive, is a digital game in order to capture the attention of less eager or otherwise uninvolved students. Any simulation, such as Markstrat, needs to be carefully set up, explained, and include references to journal articles. Typically, a tutor will assume that all students are interested in playing a digital game, but this survey indicates that close to 8% (evaluation cluster 1, activity cluster 4) think that games are not appropriate for them and show minimal activity. Furthermore, a Halo effect influences their perception on the tutor and subject.

Appendix: Questionnaire

(coding S: Subject, T: Tutor e.g. first question: S_A1)

SUBJECT

A. Subject Organisation

1. The aims of the subject were clearly articulated.
2. There was a clear overview of the subject segments, readings and assignments.
3. The subject was structured in a way that helped me to understand.
4. The various learning tools were used effectively (e.g. discussion boards, self-assessment exercises, instant messenger).
5. The peer interaction in this subject contributed to my learning.

B. Subject Content and Workload

1. The subject content was relevant to my learning needs.
2. The subject content was engaging.
3. The writing style of the online subject content (excluding the readings, cases, and the textbook) was clear and easy to read.

4. The online subject content was appropriately linked to third party content (e.g. readings, cases, the textbook).
5. The textbook used in this subject was useful for my learning needs.
6. The subject workload was appropriate for a reputable MBA program.
7. The case studies selected for this subject were useful for my learning needs.

C. Subject Assessment

1. The assessment items were thought-provoking and challenging.
2. The relative weightings of assessment items (e.g. discussion boards, case assignments, examination etc.) were appropriate.
3. The ratio of individual to team assignments was appropriate.
4. The formats for assignments and the final exam in this subject were clearly explained.
5. The assessment methods and feedback in this subject helped my learning.
6. The assessment criteria for the assessment items in this subject were clearly delineated.
7. Assessment methods were compatible with the stated learning outcomes.
8. The assessment was sufficiently flexible to accommodate my learning style and non-study related activities (eg. career, family, travel).

D. Subject Usability

1. The subject content was easy to navigate.
2. There was flexibility in terms of how I was able to view the subject content (e.g. printing text when required, viewing certain parts rather than the whole of an animation, changing font size, etc.)
3. The subject content was displayed with an appropriate balance of text, graphics, and animation.
4. The case studies and readings used in the subject were easily accessible.

E. Overall Rating

1. Overall, how would you rate the quality of your learning in this subject (1 = poor, 5 = excellent).
-

2. TUTOR

A. Personality

1. The professor was knowledgeable in his/her field.
2. The professor was enthusiastic.
3. The professor was helpful.
4. The professor was fair and unbiased.
5. The professor was well organised.

B. Learning Facilitation

1. The professor added value to the subject matter, increasing my interest.
2. The professor encouraged students to think critically.

3. The professor encouraged students to interact with others using various learning tools (eg. discussion boards, instant messenger, team assignments).

4. The professor gave clear instructions for assignments and other activities.

5. The professor made clear what I needed to do to be successful in this subject.

6. The professor showed genuine concern for student progress and needs.

7. When called upon, the professor explained difficult topics and concepts in easily understood ways.

8. The professor created an environment conducive to learning.

9. The professor used a range of methods to improve student understanding.

C. Quality of Feedback

1. The professor was receptive to student's views and feedback.

2. The professor provided feedback which was helpful and constructive.

3. The professor gave advice that met the individual needs of the students.

4. The professor responded to queries quickly and efficiently.

5. The professor suggested specific ways in which students might improve their academic performance.

D. Overall Rating

1. Overall, how would you rate the performance of the professor in this subject?
-

E. Overall Satisfaction Level

1. Overall, how would you rate your satisfaction level in this subject?

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FACTORS AFFECTING BENEFITS OF E-PROCUREMENT SYSTEMS: EXPERIENCE OF AN AUSTRALIAN CITY COUNCIL

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ABSTRACT

Despite years of research into e-business systems, still little is reported on how various factors affect the ways local government councils experience benefits from e-procurement systems. We thus present the experience of a Melbourne-based council that has been using an e-procurement system for some time, and discuss the factors that the council perceives to have influenced the benefits arising from the use of that system. Senior management support, presence of e-catalogues, employee training in e-procurement systems, and willingness of suppliers to participate in council's e-procurement implementation initiative, are found to be key factors. The implications of these factors are outlined.

Keywords: e-procurement, e-business, benefits, factors, local government

INTRODUCTION

During the past decade, many organisations have implemented various types of web-enabled e-procurement systems. When successfully implemented, these systems have the potential to provide organisations with operational and strategic benefits alike [8, 18, 26]. However, the findings of the existing e-procurement literature about the attainment of benefits are mixed. It is not clearly known why a variation in experiencing e-procurement systems benefits is observed [10]. We argue that the presence of a range of factors may influence the benefits arising from the implementation of e-procurement systems. Little empirical studies are however reported that discuss how various organisational, supply chain oriented, and technological factors play an important role in influencing the ways e-procurement systems could provide benefits to buying organisations which implement these systems. This is particularly true for the local government sector for which there is now a growing call for enforcing increased transparency and accountability through automation of procurement function [20]. Against this backdrop, in this article we report the findings of an

exploratory case study that was initiated within a large Melbourne-based city council to find out how it perceived the influence of various factors affecting its experience of benefits from the implementation of an e-procurement system. We argue that understanding these factors is useful to the local government sector which may benefit from the lessons learned from this council. The findings are also valuable to the broader e-business researcher community who may like to formulate a more comprehensive model for making predictions of e-procurement systems benefits for the public sector.

BACKGROUND LITERATURE

E-procurement systems: In its simple terms, e-procurement refers to the application of e-commerce technologies in support of an organisation's purchasing activities [7]. It involves the use of integrated (commonly web-based) communication systems for the conduct of part or all the purchasing process; a process that may incorporate stages from the initial need identification by employees, through search, sourcing, negotiation, ordering, receipt and post purchase review [4]. Some popular examples of e-procurement systems include SAP EBP, Straightbuy and Oracle iProcurement, among others.

E-procurement systems benefits: E-procurement systems have the potential to offer both operational and strategic benefits [26]. A summary of benefits is shown in Table 1. Operational benefits are internal focused and can help organisations to gain immediate short term benefits. Typical examples include reduced transaction costs, shorter order cycle, reduced inventory, and less maverick buying practices. In contrast, strategic benefits are often intangible in nature and take considerable time to achieve. They include such benefits as greater choice of suppliers and increased understanding of procurement needs.

Operational benefits: E-procurement systems can contribute to a) reduced transaction costs [3, 6] because various forms (e.g. requisition, purchase orders) are replaced by electronic documents. Purchase orders are sent to the authorised

suppliers electronically which brings a savings in paper and postage costs. Furthermore, e-invoices received from suppliers results in fewer phone calls which in turn reduce transaction costs. E-procurement systems can even help in significantly b)shortening order cycle by reducing delays [27]. There is no more waiting time wasted in the in-trays or out-trays. Documents travel directly to the right people electronically. Requisition approvals are obtained much faster because a series of purchasing policies are built-in the system [23]. Furthermore, employees need not spend time to call up procurement staff as all available items are organised in electronic catalogues which can be accessed from desktops [21]. E-procurement systems can also help reduce c)maverick purchasing practices [25]. Employees can only choose those items that are supported by the e-catalogues from the qualified suppliers [17; 25]. This prevents employees to choose goods from not approved suppliers [6]. Moreover, when an employee adds the selected item into a shopping cart, the system checks if he/she has the authority to buy the item based on the built-in purchasing policies [23]. Furthermore, greater selection of suppliers results in d)increased competitions; this puts pressure on suppliers as they are required to provide better quality of products at a competitive price with enhanced delivery services [1]. One of the outcomes is the increasing urge of suppliers to deliver goods on time. Therefore, inventory stock levels are decreased [4].

Table 1. E-procurement benefits: A summary

Types of benefits	Literature Sources
Operational benefits	
Reduced transaction cost	3,6
Shorter order cycle	27,23
Reduced maverick buying	25,17
Strategic benefits	
Finding appropriate strategic suppliers	16,12,14,1
Better understanding of organisations purchasing needs	22
Increased competition	1

Strategic benefits: E-procurement systems enable organisations to find suppliers globally (16). Due to the commercialisation of the Internet, suppliers appear online [12]. This opens a new era for organisations because e-procurement systems enable buying organisations to visit the websites of suppliers and allow punch-out practices even though the suppliers are located in different parts of globe [14]. As a consequence, finding the right suppliers to suit an organisation's needs is no longer a problem [1]. In addition, the reporting

function of the e-procurement system assists managers to better understand their organisation's purchasing needs [22]. Typical reports highlight an organisation's purchasing patterns and budgetary controls, among others.

Factors affecting benefits: We argue that the benefits (discussed above) are not automatically experienced by organisations upon implementation of their e-procurement systems. We suggest that these benefits are more likely to be achieved when a set of facilitating factors are present in organisations. According to John and Michael [11], factors represent those "few key areas where things must go right for the business to flourish." Drawing on a synthesis of the existing e-procurement literature, we have identified 4 factors which managers should consider for wanting to experience benefits from the implementation of e-procurement systems. These are briefly discussed below.

Factor 1: *Senior management support*: Without senior management support, an e-procurement system will find it difficult to survive in the procuring process of an organisation [2]. Introducing e-procurement systems can improve budget controls in organisations. However, if departmental managers are afraid that their departmental budgets are going to be cut down in the next financial period due to the reports generated from the data collected by the e-procurement systems, they are unlikely to support these systems [4]. Moreover, many managers are still concerned about the Internet security regarding the online payments to their suppliers [5]. Therefore, they might hesitate to render support to the integration of the system with suppliers which may in turn affect the realisation of benefits.

Factor 2: *Employee training*: Employee training helps improve their confidence and reduce resistance by addressing their fear for perceived needs for high learning skills, management monitoring, and job loss [18]. Training can also motivate employees to prepare purchase orders in compliance with new organisational policies enforced through e-catalogues supported by e-procurement systems. Training can help employees learn how to prepare appropriate reports from the e-procurement systems which aim to offer better understanding of their and their department's purchasing needs and patterns.

Factor 3: *E-catalogues*: Another factor that can influence the realisation of e-procurement benefits is the presence of e-catalogues. Current generation of e-catalogues contain attractive graphics/pictures, and even sound effects [12]. The presence of such catalogues help ensure the employees of the buying organisations can place correct purchase orders (POs) for the approved products supported by management. Such

catalogues also help reduce maverick buying practices [19]. The use of e-catalogues further helps reduce PO transaction costs by minimising product search time [24].

Factor 4: Willingness of suppliers: Yet another key factor that may affect e-procurement benefits is the willingness of suppliers to participate into the integration process of linking supply chain members. Connecting with suppliers can eliminate paper invoices which greatly reduces the inefficiency of the procurement process by avoiding a conflict between purchase orders and invoices [23]. The suppliers can make sales prediction because of the availability of information that is provided by the e-procurement systems [12].

Literature gaps: Even though there exists a rich body of literature on e-procurement benefits and some fragmented discussion on factors affecting those benefits, to the best of our knowledge we are not aware of any empirical work that investigates how benefits from e-procurement systems implementation are influenced by various factors in general and for the local government context in particular. Our research reported in this article seeks to address this gap in the literature.

RESEARCH APPROACH

An exploratory case study research approach was chosen for two reasons: a) this research is a theory building exercise [29] as we intend to develop a preliminary factor-based model by drawing on the actual experience of the participating city council and key observations from the past literature analysis, b) our purpose is to explore the possible existence of a set of factors that may influence the attainment of e-procurement benefits for the Australian local government context. This particular aspect has not been investigated systematically. According to [15], case study is suitable for exploratory and theory building kind of research. The unit of analysis, in our research, is an individual organisation because one single e-procurement system is adequate to address organisation wide indirect procurement process. Data was gathered from multiple sources, including formal interviews with key informants, internal documents, and city council website. A semi-structured interview protocol was developed to guide interviews. A total of six in-depth interviews were arranged with three types of managers: Purchasing Administrator, IT manager, and several business managers (e.g. Corporate Service Manager, various business managers) who are active users of e-procurement system. Data collected from the interviewees were analysed using the pattern matching logic described by [29]. This technique compares an empirically derived pattern with the predicted one. Data analysis was conducted manually by

developing a coding scheme based on which each interview transcript was transcribed and coded for pattern matching. Based on the suggestions of [29], reliability was addressed by developing a case study protocol and a summary of definitions concerning e-procurement factors and benefits. The protocol and the summary of definitions were both sent to the participating interviewees prior to the actual interviews. On the other hand, validity was addressed using data collected from multiple sources and having interviewees reviewed their own interview transcripts.

CASE DESCRIPTION

A large local council located in the city of Melbourne was chosen as a case site because it is a pioneer in introducing an e-procurement system within the Victorian local government sector, and that it agreed to share its e-procurement experience with us. The council offers over 100 types of services to about 150,000 residents. Its annual expenditure was A\$60 million (A\$1 = US\$1.05). On an average, the council produces 20,000 purchase orders (POs) and receives about 60,000 invoices per annum. In 2005, the council introduced Trans AXS e-procurement system from a US-based vendor. Figure 1 illustrates a graphical representation of high level architecture of the operation of the e-procurement system running in the city council.

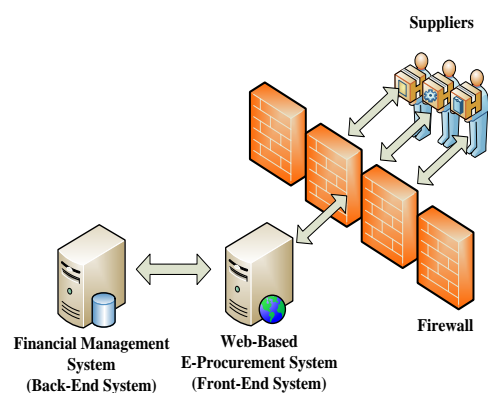


Figure 1: A high level operation of e-procurement system used in the city council

The system is integrated with its back-end financial management system. Currently, information about 2500 suppliers is stored in the e-procurement system which sends purchase orders electronically in three different formats: internet-fax, e-mail, and XML. With most suppliers, the e-procurement system sends purchase order via e-mail because these suppliers are small companies and lack IT sophistication and financial capability to be fully integrated through XML technology. However, the council interacts in XML format with a major office supplies provider. At present, about 180

employees use the e-procurement system.

EMPIRICAL FINDINGS

Drawing on the views expressed by the participating managers, a summary is prepared (Table 2) that highlights the key benefits experienced by the council. The empirical evidence suggests that the council has primarily experienced operational benefits (e.g. lower transaction costs and less maverick buying). A majority of the managers agreed that a reduction in transaction costs was a major benefit as a result of using the e-procurement system at the city council. These managers further suggested that the introduction of the e-procurement system helped the council in bringing a reduction in its maverick buying practice. Two reasons were cited. First, the e-procurement system contains information about those suppliers who have been pre-qualified. This means that even if a council staff receives an approval order, that order cannot be sent to any supplier other than the pre-qualified ones. However, no evidence was found in support of shorter order cycle at the council. Another observation is that limited strategic benefits were perceived by the council. For example, there is a mixed opinion concerning the effect of the e-procurement system on improved understanding purchasing needs of the city council, while no evidence was found in support of obtaining greater choice of suppliers.

Table 2: Responses of managers about e-procurement benefits at the council

Benefits	Interviewees*						Remarks
	A	B	C	D	E	F	
<i>Lower transaction costs</i>	✓	✓	✓	✓	×	✓	Consistent with the literature
<i>Shorter order cycle</i>	×	×	×	×	×	×	Different from the literature
<i>Provide greater choice of suppliers</i>	×	×	×	×	×	×	Different from the literature
<i>Less maverick buying</i>	✓	✓	×	✓	✓	✓	Consistent with the literature
<i>Improved understanding purchasing needs</i>	✓	✓	×	×	×	✓	Some support for the literature

*Note: A: IT manager, B: corporate service manager, D: purchasing administrator, C, E & F: business managers

Drawing on the responses from the participating

managers, another summary is prepared (Table 2) which indicates the presence/absence of influence of factors on e-procurement benefits perceived by the city council. The ticks indicate a positive influence while crosses show no influence of the factors at all.

Table 3: Responses of managers about the influence factors affecting e-procurement benefits

Key Factors	Interviewees*					
	A	B	C	D	E	F
<i>Senior management support</i>	✓	✓	✓	✓	×	✓
<i>Employee training</i>	✓	✓	✓	✓	✓	✓
<i>Presence of e-catalogs</i>	✓	✓	✓	×		✓
<i>Willingness of suppliers</i>	✓	✓	✓	✓	✓	✓

*Note: A: IT manager, B: corporate service manager, D: purchasing administrator, C, E & F: business managers

Most participating managers confirmed a positive influence of senior management support on the benefits experienced from the e-procurement system. A discussion with the managers revealed that senior management support affected all the 3 key benefits (listed in Table 1) of the e-procurement system. They did not indicate whether a particular benefit was more influenced than others due to senior management support. According to the Purchasing Administrator (D): "With e-procurement systems, unless you got that management support, no matter how good the system is, it won't work and won't yield any meaningful benefits. So e-procurement, yes, at the city council it certainly has management behind it."

Another business manager (C) provided rich insights into how senior management support affected benefits. According to this manager, senior management support was needed to put new procedures in place and to make improvements in the procurement process. In summary, without senior management involvement, benefits from the e-procurement system could not emerge.

All participating managers confirmed that employee training was an essential factor which positively influenced the realisation of benefits arising from the e-procurement system. The importance of e-procurement training on the realisation of the benefits was manifested when Corporate Service Manager (B) stated that

without training, employees could easily make mistakes during the use of the e-procurement system. As such, more problems would be created for other people. When mistakes are made, this will delay the realisation of benefits. The Purchasing Administrator (D) expressed that without training, employees would not accept the e-procurement system. Therefore, no benefits could emerge when employees do not accept the system in the first place. Furthermore, two business managers (E & F) reasoned that training helped council employees learn how to use the system quickly and overcome some difficulties in using the e-procurement system. These difficulties were associated with unfriendliness of the system. Consequently, training assisted in increasing council employees' confidence and satisfaction with using the e-procurement system which in turn lead to their appreciation of the benefits that were gained from e-procurement system use at the council. According to the IT manager (A):

"Training is very important. If you don't arrange proper training for the employees, you won't get the maximum benefit out of the product. That way, I think the employee training is the most important thing, and it increases their efficiency."

Four out of six participating managers agreed that the presence of e-catalogues was an influential factor in helping the city council realise the benefits from the e-procurement system. One business manager (C) expressed some appealing views on how the presence of e-catalogues affected the benefits of e-procurement system. According to this manager:

"Yes, e-catalogues make it very efficient for the person if he/she orders anything, he/she can physically see what shape, size and color that might most suit his/her needs and budget."

A similar view was shared by Corporate Service Manager (B). She mentioned that the presence of e-catalogues provided much useful information for employees when they were making purchases. One example is a product code number. Once the product code number was known, an employee could input it into the e-procurement system and quickly order the required item. Consequently, the presence of e-catalogues made council's purchasing process more efficient.

All the managers considered the willingness of suppliers to participate in their council's e-procurement systems initiative to be a major factor which positively influenced the benefits arising from that system. However, there were no indications about whether a particular benefit was more influenced than others because of the suppliers' willingness. This was confirmed by a business manager (C) when she expressed:

"When our suppliers come on board with it and be willing to try the e-procurement system, then it

makes more efficient to use the system."

The Purchasing Administrator (D) confirmed the importance of suppliers and indicated that they must be willing to participate in order to better integrate with the city council's e-procurement system. Consequently, purchasing efficiency was greatly enhanced by having prompt access to more up-to-date information about the available products, prices, and availability. According to the Purchasing Administrator (D):

"If suppliers are more than willing to join, I think that procurement process becomes much more time efficient."

DISCUSSION

During the past decade, many organisations have implemented various types of web-enabled e-procurement systems. When successfully implemented, these systems have the potential to provide organisations with operational and strategic benefits alike [8, 19, 26]. However, the findings of the existing e-procurement literature about the attainment of benefits are mixed. It is not clearly known why a variation in experiencing e-procurement systems benefits is observed [10]. We argue that the presence of a range of factors may influence the benefits arising from the implementation of e-procurement systems. Regrettably, little empirical studies are reported that discuss how various organisational, supply chain oriented, and technological factors play an important role in influencing the ways e-procurement systems could provide benefits to buying organisations which implement these systems. This is particularly true for the local government sector for which there is now a growing call for enforcing increased transparency and accountability through automation of procurement function [19]. Against this backdrop, in this article we report the findings of an exploratory case study that was initiated within a large Melbourne-based city council to find out how it perceived the influence of various factors affecting its experience of benefits from the implementation of an e-procurement system. We argue that understanding these factors is useful to other councils and public agencies alike which may benefit from the lessons learned from this council. The findings are also valuable to the broader e-business researcher community who may like to formulate a more comprehensive model for making predictions of e-procurement systems benefits for the public sector.

The experience of the city council in receiving some operational and limited strategic benefits is not entirely surprising given the fact that several scholars (e.g. [4], [9]) who have reported the tendency of the local government sector to introduce ICT in a superficial manner. According to Kuk (13), the local government sector usually

lags behind the private sector in terms of capabilities and ICT infrastructure. It is, thus, not surprising that the participating city experienced limited strategic benefits. Another observation is that none of the participating managers discussed the role of e-procurement systems to advance transparency and accountability issues of the council's procurement practices.

On the matter of factors affecting e-procurement benefits, the experience of the city council in relation to senior management support is consistent with the views expressed in the broader e-business literature [4,5]. The participating managers confirm that without support from senior management, making improvements in the procurement process is difficult. They further indicate that putting new procedures to make procurement effective could not happen without senior management support. These managers even point out that absence of senior management support would have resulted in insufficient funding for sponsoring training. This could in turn increase the possibility of inviting implementation failure. Consequently, the benefits could not emerge without council's management support.

E-business literature also mentions employee training to be a critical factor that could influence the realisation of e-procurement benefits [28]. For the participating council context, if employees do not accept and use the e-procurement system (due to lack of training), it would be impossible to recognise the benefits that the system could offer to the council. Employee resistance was eased through training. This view is fully supported by the city council's e-procurement experience. The participating managers consider training to be important as they suggest that training facilitated the adoption of the e-procurement system by council employees. This view is supported by Rahim [18] who found training to facilitate employee acceptance of e-procurement systems. With proper training, unnecessary mistakes are significantly reduced and employees' time is saved. As a result, the overall productivity has been improved.

According to Schneider [24], the presence of e-catalogues is another important factor to influence e-procurement benefits. Besides, offering assistance to reducing maverick buying, e-catalogues also provide more flexibility to organisations. Such flexibility makes communication between buying organisations and suppliers more effective and purchasing efficient. The empirical evidence collected from the managers supports this claim. Most managers suggest that the presence of e-catalogues encourages council employees to benefit from their use of e-procurement system. This is because e-catalogues provide plenty of useful information which aids council employees' purchasing

decision making. Moreover, with the e-catalogues, council employees are able to see what they are actually ordering. This makes purchasing more time efficient.

E-procurement literature indicates that in order to fully benefit from the e-procurement systems, a complete integration is necessary [23]. However, this will not happen when suppliers are reluctant to participate. For the participating council context, many managers believe that if more suppliers are willing to try the e-procurement system with the city council, more benefits will be experienced, and they are happy to see more suppliers to join the city council's e-procurement system. For example, suppliers now can receive payments from the city council via the e-procurement system. This view is highlighted by the Purchasing Administrator (D) who remarked:

"Unless suppliers are willing to adopt this new way of purchasing, then the benefits are actually going to be reduced, if at all obtained."

We however believe that the influence of 3 (i.e. senior management support, e-catalogues, employee training) factors (out of the above mentioned 4 factors) on the realisation of benefits from e-procurement systems use at the council are also relevant for the private sector. We further argue that supplier willingness (Factor 4) may have different implications depending on the context (public or private) within which an organisation (which uses e-procurement system) operates. For example, for the local government context, city councils are often required to have business with SME's located within the councils' geographical jurisdiction to promote local economy. Hence, the councils are still required to electronically trade with their suppliers regardless of their degree of e-business capabilities. On the other hand, private sector organisations (which introduce e-procurement systems) are not guided by the government policy of buying from local SME's to promote local economy. They have more liberty to choose their suppliers regardless of geographical locations. As such, they may decide to electronically trade with those suppliers only which demonstrate both willingness and capabilities to establish electronic relationships with the private sector organisations. This is a key interpretation of our research findings which suggests that the influence of factors may vary depending on the context of the client organisations. We therefore argue that the influence of the factors identified in this study cannot be generalised across both public and private organisations.

CONCLUSION

E-procurement systems represent a mature aspect of B2B e-business initiative and are slowly

gaining acceptance in the local government sector. However, few studies are reported in the literature about how the Australian local government authorities are experiencing benefits from the implementation of these systems and in what ways various factors affect the realisation of those benefits. Our research, reported in this article, addresses this concern by undertaking an exploratory case study at a large city council in the state of Victoria, Australia. Our case study findings suggest that some operational benefits and limited strategic benefits are experienced by the council and that a total of four major factors (i.e. senior management support, employee training, presence of e-catalogues, and willingness of suppliers) affect these benefits. Therefore, one implication is that senior management of those councils which are contemplating possible introduction of e-procurement systems should guide their implementation strategy to ensure the presence of these factors because mere introduction of these systems would not automatically translate into realised benefits. Another implication is that managers responsible for preparing e-procurement business cases must regard the lack of these factors as hurdles, which if not addressed by management, could risk e-procurement systems success. Knowledge of these factors is thus useful to e-business researchers and practitioners alike. Researchers may incorporate these factors in developing a more comprehensive model for making predictions about how e-procurement systems may generate benefits. Knowing these factors is also valuable to the local government management because it can guide them for strategic planning in relation to introducing e-procurement systems by better preparing business cases and implementation strategies. Despite these contributions, the findings reported in this article cannot be generalised across the entire local government sector of Australia. Hence, further studies are required to investigate e-procurement systems benefits across multiple local government agencies from each state of Australia. In addition, in-depth multiple case studies are needed to find out the role of organisational culture (which is in turn is shaped by national culture) for comparing e-procurement benefits in the local government bodies operating across various regions (e.g. European Union and Australasian region). Future research is also needed to examine how e-procurement systems may affect business relationships between councils and their suppliers and whether changes in relationships in turn affect the realisation of e-procurement benefits. This particular aspect has not been investigated in our study. Finally, research in the form of surveys is needed to

produce statistically generalisable findings.

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OVERCOMING DIFFICULTIES OF APPLYING BUSINESS PROCESS MANAGEMENT IN REAL BUSINESS ENVIRONMENT

Boonsit Yimwadsana

ABSTRACT

Business Process Management (BPM) Systems is not often used organizations as many have predicted due to various difficulties especially in the area related to organizational management. This paper we discuss the history of business process management and a framework on how a business should apply BPM philosophy and IT together to establish a successful BPM system.

Keywords: Business Process Management, BPM, Workflow, Forms,

INTRODUCTION

Business Environment

Every business today has to cope with a collection of operations that involve individuals from different divisions. These involvements are usually created because humans perform best when their work scope is not too broad. When people have to collaborate together, the order of operation must be clearly defined. Otherwise, confusion or redundant work will occur. Designing and resolving clear work orders are, therefore, logical procedures of managers in business.

Managers are often presented with many operations waiting to be initiated and supervised. It is often the case in the real work environment that managers spend most time supervising or managing employees and resolving customer issues. The time that managers spend on improving operation and collaborative effort is then reduced due to the increase demand from customers. Operations are often become routine. Businesses that rely on routine operation are often in the position to lose its competitive edge due to the ability of its competitors to catch up. Hence, it is important that managers learn techniques on how to improve their business operations.

Workflow

Since most operations involve individuals from various departments, communication is required and a common communication protocol must be established. Unfortunately, this logical business operation seems to be lacking in many businesses. This is because companies typically divide its business into departments which usually operate differently, so they may not want to speak the same language. Instead, when a department has to work with other departments on a regular basis for

the same operation, they usually create “forms” so that they do not have to rely on human conversation much which is a major source of error and inefficiency. Form is one of the most powerful tools for collaboration in workplace. Forms also help control work order such that individuals in all departments know exactly what do based on the instructions and data fields specified in the forms. The sequence of steps or the work order is called a workflow.

A workflow can be viewed as a model of a business operation. Not only it can help define collaboration point, it can also help solve inefficient points in the network of operations. The use of workflow has been received a lot of attention since 1990s due to its highly effective benefit of reliably controlling a repeat sequence of operations. A complete workflow defines patterns of activities, worker roles, resources and information that flow in the network of activities. Combining workflow with management, activities described in a workflow can be documented and later reviewed for performance improvement.

The concept of workflow has been originated in the area of engineering and production because operations in those areas are well defined and mostly sequential with clear approval and disapproval points and paths. Workflow can be viewed as a tool to help connected different business departments together and at the same time divide functions of each department clearer.

To a number of companies, a workflow is basically a form that has to be filled out by a number of responsible staffs from various divisions. In this case, workflow paths are linear and often straightforward. However, there are situations which allow the flow to be separated into many paths. For example, a cash deposit operation in a bank will be handled by two different divisions: a unit for cash deposit valued less than one million baht, and the other unit for cash deposit valued more than one million baht. This way, without clear picture of the workflow paths, operations can be confusing to some employees.

A number of companies also refer workflow to processes, planning, flow control diagram, or supply chain. For whatever it is, workflow is a fundamental concept describing how tasks or activities are connected together to accomplish a business operation. The first business that brings

workflow concept to use is the publishing business in around 1980s. In order to publish a newspaper, for example, an integrated accumulative work conducted by a group of people is required. Without proper workflow designation, the operations of every newspaper publishing would be very hectic. Since then the workflow process revolution has extended into manufacturing, administrative, and resource allocation processes in organizations.

Workflow Management System

Thanks to the influence of information technology since 1980s, IT has been used to help manager manage workflow information better. Documents have been digitized and kept at a single server location. IT computing and network infrastructure have been deployed to reduce the usage of forms and documents. Data required for different tasks and operations can now be kept in a database for easy access. Managers and workers can view the status of operations and processes better so that managers can manage workflow conveniently. The software that supports the management of workflow information is called workflow management system.

In late 1990s, the boom of the Internet has also helped extending the workflow management into e-commerce transaction. Customers can purchase a product over the internet without using documents and the workers in an e-commerce company know exactly the steps to process the order and how to collaborate with each other. Information about the order is presented to all workers.

Workflow Management System (WMS) seems to be the silver bullet that can be used to solve any business problem. However, not many businesses appear to use workflow management system as a core business IT operation. This is because most workflow management system software focuses more on the flow creation aspect of the software. They present crafty tools and programming languages for creating connected paths of tasks or activities easily. This is a major achievement in the aspect of computer science, but it is not for business users who want the workflow to be used in their business. For every business, workflow management must also carry data and information management in order to properly keep track of business operation while keeping track of the workflow itself. A workflow management system that can draw beautiful graphs will not create any benefit to a company unless it includes document, data and information into the workflow.

Document-based Workflow

Since the introduction of Workflow Management System (WMS), workflow has been a key operational tool that helps businesses to cope with repeated activities. The data stored in workflow management system acts like data in the forms that has to be sent to different department.

In traditional organization, documents and forms are first created to handle repeat work. Forms are filled out and supporting documents are attached with the forms to request another division to start work process. Without the use of workflow management that integrates with document management systems, forms and documents must be copied at each division that the forms and documents are sent to. This is because all departments and divisions have to protect themselves from possible changes in the forms and documents once the forms and documents are out of their hands to be processed by another division or department.

Using document-based workflow also create the risk of document accessibility. Documents in paper form cannot be read easily by anyone who is not physically presented with the documents. Electronic documents are also difficult to manage access due to different types of users.

Fortunately, many workflow management solutions offer an interface to document management system. However, the document management system is usually not created to support workflow management system in the first place. This makes the deployment of workflow management system with document management system capability difficult.

Business Process Management

The unsuccessful deployment of workflow management system into real businesses makes computer scientists to rethink how to design software systems. The business aspect of the operation must also be included into the concept of workflow. The workflow itself is viewed by business users as operational level tools, not suitable for running the business at the strategic level. Thus, workflow management is replaced by Business Process Management (BPM) [1,2] which also includes a systematic method to optimize and improve business performance at the operation level. Applying BPM to organizations not only help the organizations to manage workflow, but also integrate the concept of quality control into the concept too.

Actually the concept of BPM is not new. Similar management practices such as Total Quality Management, Malcolm Baldrige Award Criteria, Six Sigma, and ISO 9000 Quality Program aim to 7

produce similar result. However, these practices concern more at the strategic policy level than at the operational level. They focus on organizational processes at the top level such as the process for the creation of problem-solving heuristic, the process for customer and competitor fact findings, and the process for quality evaluation and improvement. Generally, BPM comprise of three main activities which are the discovery of all routines that underlie the operations of an organization, the measurement of process efficiency and effectiveness, and the routine process improvement planning.

Business Process Management System

Most software vendors support four major business process management functions including workflow design and modeling, execution of activities, data collection and process monitoring, data evaluation, and data reporting. In general, BPM software is Workflow Management software with business data reporting features. However, business history indicates that 70 percent of Business Process Management projects failed due to employees' resistance to do extra work for process management, the inflexibility of workflow path, misunderstanding of BPM philosophy, and, the most important of all, the lacking of the vision to see the business in a big picture.

OVERCOMING DIFFICULTIES IN DEPLOYING BPM SYSTEMS

We discussed earlier about the difficulties of deploying BPM systems with real businesses. Many traditional businesses today have staffs working with the vision that only focus on their own scope of responsibilities. Thus, each department generate forms just work with the another division without seeing the entire flow of the process. For example, a customer service staff of a PC retailer who talks to a customer who is purchasing a laptop computer may not know anything about the process of shipping the computer to the customer's address. As a result, a customer purchase process workflow may contain many forms used between departments. There is also a high possibility that forms that are created for the same purpose are generated by various departments.

This example clearly shows that it is typical for a company to have departments that do not integrate well with each other. In order to help solve this issue, we start by realizing typical business process management requirement first before suggesting the methods on how to apply BPM systems.

We divide electronic business operations into four major categories as follows:

1. Initiation: creating websites and delivering information and services online. This focus on one-way communication between the business and customers.
2. Interaction: enabling customers to interact with the business by setting up two-way communication service channels such as customer service e-mails, online chat, and web forums.
3. Transaction: allowing customers or internal staffs to execute a business operation (such as product purchase) and start a workflow.
4. Integration: integrating internal services across the organization to work together to provide the customers with the best services.

These four categories will help us define the general framework for deploying BPM system in businesses in later sections. These three categories are common to most electronic businesses.

Framework for BPM System deployment

BPM is a philosophy and procedure for continuous optimization and improvement of business operations. Framework for BPM follows the four categories of business operations discussed in the previous section. Starting at the initiation stage, the workflow of operations and data definitions must be modeled first before designing the website and web applications of the companies. This is because appropriate information and application design on the website can allow customers and employees to follow steps corresponding to the workflow models setup in this initiation stage.

Then the business should provide two-way communication channels to customers such that the business can interactively respond to the customers quickly. Many businesses do not see the importance of this business service. However, this business service is one of the main reason why we need to implement electronic business and how electronic business can help differentiate a business from the others. If implemented, a major business workflow reengineering will be needed in order to optimize the execution of the workflow to satisfy customers demand. Workflow model for this category will not be easy to be designed. This is due to complication and uncertainty in the

process of dealing with customer issues.

After one-way (website) and two-way communication channels are prepared, the business will be ready to prepare the workflow to handle transactions that will be generated by the customers. During this transactional stage, processes should be monitored in order to keep track of data input by customers. The data collected must be stored and indexed in a database for process evaluation and process improvement at the integration stage.

Deploying BPM Framework

In order to start deploying the framework, workflow systems must be realized and modeled. It is often the case that companies do not start modeling workflow since the beginning of the company. It is likely that the businesses will have their own operational handbook and some forms for each department first before deploying workflow management system. For some companies, there can be a few hundreds of operational instruction workflow.

Once the forms and operational steps gathering phase is completed, the business must group forms and documents that have similar purpose together. Then, the business must elect a number of committees consisting of staffs from various departments corresponding to each group of business operations to clean and compact the forms and documents.

According to the authors' experience, this step is the most difficult because different individuals have different views of each process. The distribution of responsibilities and duties must be fair. Most importantly, the chairman of the committee must have a lot of experience, be able to look at the big picture of the business goals and objectives, be respected by all departments, and have authority to make decisions about the compact workflow.

The modeling of workflow must correspond to the four categories of business operation. Even though the four categories are not related to each other in terms of business purpose, but their data and workflow must be linked together. Hence, the modeling of BPM workflow must take into account the four categories of business operation as well.

Once the workflows are compacted and finalized, the business can start deploying BPM system software. Most businesses follow simple steps which are as follows:

1. Define organizational strategies and objectives.
2. Define key data to be collected from the key performance indexes.
3. Define key operational plans and business processes that support the business objectives.
4. Define detailed workflows that support the business operations.
5. Define data to be collected for workflow and business process monitoring.
6. Create documents or forms which will be used to collect data in transactional phase. Make sure that the data collected must be kept in the database without data redundancy.
7. Associate flows and documents with workflow by assigning forms and documents to each workflow.
8. Define data collection and data analysis plan. Make sure that the data is kept in the database.
9. Test the workflow activating the BPM software. The data entered by the individual who starts the workflow will be collected in a database so that it can be used in the interaction and integration stage of the business operation.

Initiation: Process and workflow modeling

Interaction: Process execution and monitoring

Transaction: Data collection

Integration: Evaluation of all business processes to find opportunities for improvement and drive for organizational change.

Table 1: Business Process Management Execution Framework

By deploying the BPM systems as suggested above, the organization's BPM effort is separated into layers as shown in Figure 1. In general, the IT infrastructure that helps support all BPM operation is the database because data and information are key in making workflow and business processes operational with human. However, the process of obtaining each model does not follow the order of the layer.

Before the DATA MODEL is defined, the business managers must finalize business objectives and strategies by using any business process management methods such as Total Quality Management (TQM), Malcolm Baldrige Award, ISO 9000 Series, or Six Sigma. The objectives will define the key performance indexes (KPI) of the business that managers will

use to measure the performance of the business in the market. The KPI will be used with balance scorecard or dashboard in order to provide real time report on business performance. This steps leads to the final designation of the data model.

However, this data model that the firm just established cannot completely support the operation of BPM. BPM also requires the model of workflow and performance improvement strategies. Hence, once the key data model is defined from business strategies and objectives, key process flow must be constructed.

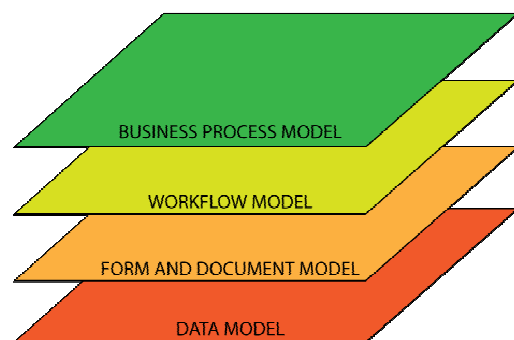


Figure 1: Implementation structure of BPM system deployment process.

As mentioned earlier, it is not easy to create key process flow. Departments across the business organization have to sit together to agree on the process flows according to the business rules. In some cases, the limitation of the BPM systems may have to be taken into account during the design of the business workflow. In addition, the data, the type and layout of documents and forms to put data in, and the staffs responsible for monitoring and controlling the flow of the data and documents must be defined. In addition, approval points and alternative routes must also be addressed during the workflow creation process.

This process will be even more difficult if exceptions can happen. A company that has to offer services with quickness may have to sometimes trust the customer or previous department and let the process to skip some activities in the workflow. For example, in stock trading operation, when a customer deposits some cash and purchases a number of stocks right after the cash deposit, the purchase must go through before the auditing department can finish verifying the cash deposit settlement which can take up to a few hours. The speed of the change in the price of stock is much more than the speed of the auditing department. Hence, in some situations, workflow may have to allow such exceptions. However, as mentioned earlier,

workflow is generated to support routine operations. Exceptions should always be considered during all business workflow modeling and it should be included in the workflow design if possible.

After the design of workflow is completed, it is necessary for all departments to create a medium of communication. The medium of communication can be either physical such as paper-based forms or paper documents or virtual such as electronic forms or electronic documents. The model of forms and documents will be necessary for routine works such that any individual, or even new employee, will be able to understand how to enter data and information and execute the workflow process immediately and conveniently. Designing forms and documents to be used with workflow is an art. Good forms and supporting documents allow employees to feel how well the company operates. Confusing forms usually visualize the complexity in workplace. This should be avoided.

The forms and documents should be integrated with workflow management systems such that the forms and documents are used as tools to collect data for the workflow. The status of workflow and data collected in the database can be retrieved and reported for business managers. The selection of what data to be collected, how to analyze data to create information, and how to report the information are key components of the business process modeling. These components also required the application of the philosophy of business process engineering and quality frameworks.

CONCLUSIONS

Nowadays, universities and training institutions offer management courses which prepare managers with business process management philosophy. This philosophy can be applied successfully today, in particular in large enterprises, with the help of information technology. However, applying BPM systems is not an easy task. Managers and every staffs must have both the clear picture of the business, the process of using BPM systems, and the knowledge of data required for the process flow. Most managers know the benefits of using BPM systems but deploying it requires much hard work. Clear understanding of steps to implement BPM systems offered in this article will help managers to foresee difficulties and prepare to tackle them.

The managers should not forget that the ones who operate BPM systems are humans, not machines.

BPM systems should be used to help solve routine works. Since not all work processes are routine, business managers should always have contingency plan specified in the workflow so that their employees will know exactly what to do in case emergency situation arises.

During the design of the BPM systems, business managers must ensure that the systems support the tradition BPM approaches which are reuse, engineering, communication, and maintenance.

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A Study of E-Service Applications in E-commerce Websites

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ABSTRACT

E-Services use the internet as the main channel for business to interact and communicate with their consumers. The purpose of this paper is to study e-Service applications, for example, FAQs and text chat, which e-commerce consumers prefer to use when they want to acquire more information about products. We focus on four different types of questions consumers may ask which are (1) description question, (2) method question, (3) explanation question, and (4) comparison question. Also, in this study, we categorize products into two categories: (1) general or non-embarrassing products (such as shampoo) and (2) embarrassing products (such as condom). The data was collected from 400 respondents in Thailand.

Keywords: e-Service, e-Service Application, e-CRM, FAQs, Text Chat, Perceived Interactivity, Embarrassing Product

Introduction

E-services are considered crucial for customer relationship management in B2C e-commerce environment (e-CRM) where consumers and vendors do not meet face-to-face interaction. A click of mouse is enough for an online consumer to select a new retailer [22]. Therefore, appropriate and efficient e-service applications are needed in all online shopping website.

According to Accenture [9], 77% of consumers said that the use of e-service applications, such as email, product comparison, online ads, and online ordering, improved their product purchasing experiences. 66% of consumers said that e-service applications, such as text chat and FAQs improved the level of customer service.

It was also found that consumers are embarrassed when purchasing some specific products, such as condom [3, 4], or feel nervous when talking to a salesperson about specific subjects [7]. Grace (2007) found that consumer embarrassment was mainly from the interaction of service provider, consumer and other persons (such as other consumers). It seems that e-services can help reducing consumer embarrassment because with e-services, consumers can avoid unwilling confrontation [14].

In e-commerce environment, a consumer can get product information from various e-service applications, such as FAQs, text chat, email, VoIP, and video chat. Consumers who have any types of questions (questions concerning description, method, explanation or comparison of products) can use some kinds of e-services to obtain their answers. E-service users are consumers who interact with some kinds of e-service applications. For e-retailers, it is important to provide most preferable e-service applications for their consumers in different situations, for example, when product types are different or when consumers have different types of questions. The results of this study can help e-retailers to improve their website quality by providing appropriate applications to facilitate their consumers. In addition, this study also investigates consumer perceived interactivity in different e-service applications.

Literature Review

E-service Applications

E-Service applications which are commonly used can be categorized into two types [19, 24]: (1) Customer-facing applications or applications consumers interact directly with a company representative and (2) Customer-touching applications or applications consumers interact with a computer program instead of a company representative.

It was found that consumer's preferred level of interactivity was based on situation and personal characteristic of that consumer [5]. Therefore, when product types or question types are different, consumer may choose to use different e-service applications.

Product Types

Different types of products can affect consumer behavior differently [23]. In addition, purchasing decision of consumer also depends on product types, product involvement and other factors [20]. E-service applications help consumers to avoid face-to-face communication or interaction [14]. This is particularly important when a consumer is dealing with sensitive issues, such as buying embarrassing products.

Prior research found that embarrassment in purchasing product can affect the selection of customer-facing applications, i.e., text chat, VoIP and video chat. The past studies indicated that people used all three formats of customer-facing applications when considering non-embarrassing products such as shampoo. However, when considering purchasing embarrassing products such as condom, people preferred text chat [10].

This study aims to contribute to e-CRM research field by proposing one of customer-touching applications, FAQs, which seems more appropriate when consumers consider embarrassing products [21].

Question Types

In e-service environment, consumers can obtain information directly from e-retailer's website rather than having to interact with salespersons in a physical store. Consumers also believe that they will get more information online [25], partly because their questions can be answered via online channel [1].

Kwon (2007) studied the effect of question types on the effectiveness of collaborative chat reference service in library and found that question type has influence on richness of user's answer and user's satisfaction.

The past research has proposed that different question type can affect search behavior differently [15] and that different communication channels can influence consumer information richness differently [17].

Research Methods

E-service Applications

In this research, we focused on two types of e-service applications: (1) Text chat, as a representative of customer-facing applications, and (2) FAQs, as a representative of customer-touching applications.

Product Types

In this study, we categorized products into two types: (1) embarrassing products, and (2) general or non-embarrassing products. We selected condom as a representative for embarrassing product because condom purchase was commonly associated with embarrassment [3, 4]. Shampoo was selected as a representative of non-embarrassing products. Prior studies [10, 12] reported that, shampoo gave consumers the lowest level of embarrassment for the personal care products.

Question Types

In this research, we used Primary Taxonomy [17] to categorize consumer questions into four types. These types include (1) description questions or questions which need answers that contain description, such as definition and concept, (2) method questions or questions which need answers that contain method, such as procedure and calculation, (3) explanation questions or questions which need answers that contain explanation, such as goal orientation and causal antecedent, and (4) comparison questions or questions which need answers that contain comparison, such as concept comparison and improvement. Some examples of each question types are shown in Table 2.

Perceived Interactivity

Perceived Interactivity (PI) is defined as the level of interaction that a user/consumer perceives as he/she uses a particular e-service. Perceived Interactivity can also be defined as how an e-service is responsive to user/consumer needs [2].

Research Question

The main objective of this study was to find out the e-service applications which were most preferred by e-commerce consumers:

- (1) when the product types were different
 - a. Embarrassing Product
 - b. Non-embarrassing Product
- (2) when the question types were different
 - a. Description Question
 - b. Method Question
 - c. Explanation Question
 - d. Comparison Question
- (3) when both product types and question types were different.

In Addition, we investigated consumer perception of interactivity in the context of e-service applications.

Research Instrument Development

In this study, we selected a self-report questionnaire as the research instrument. The questionnaire had five parts. In the first and second parts of the questionnaire, the respondents were asked to answer questions to measure perceived interactivity for FAQs and text chat, consecutively, as shown in Table 1. In the third and fourth parts of questionnaire, the respondents were asked to select the most preferable e-service application for each question types when product types are embarrassing product and non-embarrassing product, consecutively, as shown in Table 2. Finally, in the last part of

the questionnaire, there were demographic question, as shown in Table 3.

Measurement

Measurement for perceived interactivity was adapted from [2] using a five-point likert scale. The Cronbach's alpha coefficient values for the measures were 0.765 and 0.761 for perceived interactivity of FAQs and text chat, consecutively.

Data Collection-Subjects

It was reported that 31.8% of Internet users in Thailand, are between 30-39 years old and 28% of them are between 20-29 years old [16]. Therefore, we selected samples between 20-39 years old as our main group of subjects. The data were collected from 400 respondents in Thailand. Most of respondents have internet experience more than 7 years. Especially, nearly 2/3 of them have online shopping experiences. A summary of demographic information of those 400 respondents is shown in Table 3.

Table 1 – Items of measurement, mean score value and standard deviation for Perceived Interactivity

Item	FAQs		Text chat	
	Mean	S.D.	Mean	S.D.
Interacting with this FAQs/Text chat is like having a conversation with a sociable knowledge and warm representative from the company.	2.91	0.750	3.70	0.690
I felt as if this FAQs/Text chat talked back to me while I was navigating.	3.06	0.879	4.08	0.612
I perceive the FAQs/Text chat to be sensitive to my needs for information.	3.19	0.851	3.52	0.742
My interaction level with the FAQs/Text chat was high.	2.89	0.932	3.99	0.754
I don't interact with the FAQs/Text chat much*	2.91	0.991	3.89	0.880

* Item with reverse value

Table 2 – Questions for each question type and each product type

Product Types	Question Types	Item
Embarrassing Product (condom)	Description	What are the benefits of aloe vera concerning the lubrication of condom?
	Method	How to put on condom without touching?
	Explanation	Which condom has smooth surface, lubricant and rose smell?
	Comparison	What are the differences between condom A and B?
Non-embarrassing Product (shampoo)	Description	What are the benefits of grape-seed oil in a shampoo?
	Method	How to use a spa shampoo?
	Explanation	Which shampoo, with rose oil, is best for frizzy and unmanageable hair?
	Comparison	What are the differences between shampoo A and B?

Table 3 – Summary of respondents' demographic

Demographics		%
Gender	Female	58.4
	Male	41.6
Age	Less than 20 years	11.8
	20-29 years	63.7
	30-39 years	22.3
	40-49 years	1.3
	50 years or more	1.0
Internet experience	Less than 2 years	0.8
	2-4 years	1.8
	5-7 years	13.0
	7 years or more	84.5
Time spend on Internet per week	Less than 1 hour	0.3
	1-2 hours	8.3
	3-5 hours	16.8
	6-7 hours	10.0
Online shopping experience in the past one year	More than 7 hours	64.7
	None	27.1
	1 time	12.8
	2-3 times	24.6
	4-5 times	15.0
	6-10 times	9.3
Experience (both online and offline) in shopping for embarrassing product in the past one year	More than 10 times	11.3
	None	76.4
	1 time	6.8
	2-3 times	9.5
	4-5 times	3.8
	6-10 times	1.0
	More than 10 times	2.5

Data Analysis

Results on Perceived Interactivity

Table 4 – Mean score values of perceived interactivity for each e-service applications with Paired sample t-test

E-service Applications	Mean score	t	Sig. (2-tailed)
FAQs	2.99	-22.306	0.000
Text chat	3.84		

Paired sample t-test, as shown in Table 4, indicates that text chat associates with significantly higher perceived interactivity than FAQs.

Result on Selection of E-service Applications

We performed statistical analysis on the collected data, mostly proportional test. The results of data analysis are shown in Table 5 to Table 9.

Table 5 – Overall results of e-service application selection

E-service Applications	E-service Application Selection by Consumers	Sig. (1-tailed)
FAQs	62.4%	Yes
Text chat	37.6%	

Table 5 indicates that in general, without considering product types, FAQs is significantly more preferred by most consumers than text chat.

Table 6 – Results of e-service application selection when product types are different

Product Type	E-service Applications Selection by Consumers		Sig. (1-tailed)
	FAQs	Text chat	
Embarrassing Product	71.3%	28.7%	Yes
Non-Embarrassing Product	53.6%	46.4%	No
Sig. (1-tailed)	No	No	

We can conclude from Table 6 that (1) when product type is embarrassing product, FAQs is significantly more preferred by most consumers than text chat, (2) when product types is non-embarrassing product, FAQs is more preferred by most consumers than text chat., but not significantly different, (3) consumers prefer FAQs when product type is embarrassing product, but not significantly different from when the product type is non-embarrassing product, and (4) consumers prefer text chat when product type is non-embarrassing product, but not significantly different from when the product type is embarrassing product.

Table 7 - Result of e-service application selection when question types are different

Question Type	E-service Applications Selection by Consumers		Sig. (1-tailed)
	FAQs	Text chat	
Description	65.8%	34.2%	Yes
Method	66.1%	33.9%	Yes
Explanation	57.3%	42.7%	Yes
Comparison	60.6%	39.4%	Yes

Table 7 indicates that in general, without considering product types, FAQs is significantly more preferred by most consumers than text chat for all types of questions.

Table 8 - Result of e-service application selection when product type is embarrassing product and question types are different

Question Types	E-service Applications Selection by Consumers		Sig. (1-tailed)
	FAQs	Text chat	
Description	71.3%	28.7%	Yes
Method	74.5%	25.5%	Yes
Explanation	67.7%	32.3%	Yes
Comparison	71.7%	28.3%	Yes

Table 8 indicates that when consumer want more information for embarrassing products, FAQs is significantly more preferred by most consumers than text chat for all types of questions.

Table 9 - Result of e-service application selection when product type is non-embarrassing product and question types are different

Question Types	E-service Applications Selection by Consumers		Sig. (1-tailed)
	FAQs	Text chat	
Description	60.25%	39.75%	Yes
Method	57.75%	42.25%	No
Explanation	46.75%	53.25%	No
Comparison	49.5%	50.5%	No

Table 9 indicates that when product type is non-embarrassing product: (1) consumers prefer FAQs when the question type is description question, significantly different from text chat, (2) consumers prefer FAQs when the question type is method question, but not significantly different from text chat, (3) consumers prefer text chat when question type is explanation question, but not significantly different from FAQs, and (4) consumers prefer text chat when question type is comparison question, but not significantly different from FAQs.

Conclusion

How to choose appropriate e-service applications for e-commerce websites depends on many factors, such as product type and consumer question types. This study indicated that most consumers preferred FAQs. However, text chat influences more consumer perceived interactivity than FAQs. When product types and question

types were moderators, we found that consumers preferred different e-service applications. However, we also found some evidence that consumers did not use level of interactivity as a main factor to choose e-service applications. However, they use product types and question types as factors to choose the service. Consumers may choose to use FAQs and if FAQs is unable to answer their questions, then they will choose to use text chat.

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Building a Framework for Improving Information Quality in Accounting Information Systems Adoption

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Abstract

Information Quality (IQ) has become a critical, strategic issue in Accounting Information Systems (AIS) adoption. In order to implement AIS adoption successfully, it is important to consider the quality of information use throughout the adoption process, which seriously impacts the effectiveness of AIS adoption practice and the optimization of AIS adoption decisions. There is a growing need for research to provide insights into issues and solutions related to IQ in AIS adoption. The need for an integrated approach to improve IQ in AIS adoption, as well as the unique characteristics of accounting data, demands an AIS adoption specific IQ framework. Thus, this research will investigate the IQ issues emerging during the adoption of AIS systems with the aim of developing a framework to guide organisations on implementing an adequate IQ management approach during the system adoption process. This framework will be developed from case studies by collecting qualitative data (interviews).

Keywords: Information Quality, Accounting Information Systems, Accounting Information Systems Adoption, Information Quality Dimensions.

Introduction

Nowadays, information is one of the main resources used and applied in organisations. Information development is essential for improving or developing new contexts to support management, strategy, and decision making [13, 15, 23]. Furthermore, management information is important in organisations as it requires quality information, to improve the efficiency and effectiveness of their operations for higher profitability and increase productivity. For significant business decision-making, IQ has become an important consideration for any organisation that wants to perform a variety of tasks well. Information Quality (IQ) is the capability of data to be fit for use.

There is strong evidence that IQ issues have become a critical concern for organisations [13, 15]. Salaun and Flores (2001) indicate that, currently, customers require good quality information which is basic to the

requirements of business activity and lead to high quality work performance in the partnership between supplier and consumer [23]. According to Lee, Strong et al (2002), the growth of data warehouses has increased the need for quality data in organisations to perform well, obtain competitive advantage, and survive in today's global economy [13]. Thus, data management is important in organisations, in order to support and develop different departments in corporations by enabling work processes of all sorts as well as decision-making.

In particular, accounting is essential in making economic decisions. Furthermore, accounting and management decision-making is dependent on the fit of the accounting information system with the organisation's requirements. Therefore, organisations must pay attention to the efficiency of their accounting information systems. In order to implement AIS successfully, it is important to address the quality of information adoption, to manage all the processes of accounting systems. Thus, this research intends to study this perspective of IQ management in AIS adoption.

Research Questions

The goal of this research is to develop a framework for information quality management to provide guidance for AIS adoption. In terms of achieving this objective, the following questions will be investigated:

1. What are the appropriate IQ criteria for AIS adoption?
2. How do you choose and use (adopt) an accounting information system that best achieves these criteria?

This research will be conducted in accounting firms in Thailand which have, or intend to, adopt and implement accounting information systems. The focus of this research is not on the design of AIS systems, but on helping organisations to choose / acquire better AIS systems to match their IQ requirements. However, it is anticipated that the research results will also be useful to AIS developers for better system design.

Research Objective

This research addresses various case studies from different organisations related to IQ management in AIS adoption. Outcomes of this research will contribute to providing an IQ framework specifically for AIS adoption, for guidelines on how to ensure information quality in AIS adoption. The framework encapsulates the critical IQ factors derived from internal as well as external organisations.

Preliminary literature reviews

Information quality problems can impact on operations, increase costs and lower worker job satisfaction, while increasing customer dissatisfaction [19]. In a modern world, information quality is potent in that it directs the business's future. This is because good information quality can lead to success while poor information quality can lead to failure of the business [1, 19, 20]. Consequently, information quality criteria have become important considerations for any organisation that wants to carry out a variety of processes well.

In particular, accounting can be seen as important to the information quality capacity to help business growth. Moreover, accounting information is useful to those who need to make decisions and plans about the business [22]. At the same time, accountants require accounting systems to manage all the processes of accounting in the organisation, which involves quality information in order to function effectively. In order to implement an AIS successfully, it is important to consider the quality of the system and the quality of information used throughout the adoption process [4, 16].

In order to ensure information quality in AIS adoption, it is important to understand the underlying appropriate IQ criteria specifically for AIS adoption. However, no standard definition exists today; there have been some studies of qualitative characteristics in accounting quality management, such as FASB, IASB, AARF, and SAC3. Some of the IQ literature also addresses the critical points and steps for IQ adoption systems. Figure 1 shows the related research efforts and reflects whether these research efforts address certain issues or elements of IQ criteria factors of quality or information quality management.

Furthermore, accounting information system is dependent on the accounting standard and law each country [9, 22]. And also considering the importance of information quality in accounting and the profession's dependence on AIS systems, it is important for any accounting firms to incorporate the IQ requirements during the system adoption process (especially in the cases of adopting a commercial AIS system, of which the system design cannot be altered). Thus, this research tries to develop an adequate framework to provide such guidance.

AIS uniqueness

AIS have been a unique software application and work process for defining. In specifically, finding from Davila, Foster et al (2004) state that management AIS is the initial framing of the accounting adoption decision under accounting standard [3]. Many organisation concern to manage all process of accounting information system is dependent on the accounting standard and law each country [3, 9, 22]. According to Naomi s & Kevin s 2007 argue that three factors to affects specific as accounting quality such as the quality of the standard, a country's legal and political system, and financial reporting incentives. This is specific in accounting information system.

Moreover, finding from Rom and Rohde (2007) indicate that data integration in accounting system should be studied more narrowly and specifically [21]. Especially, information produced for financial accounting purposes is used for management accounting purposed as well. Furthermore, base on this finding, Granlund, M. and T. Malmi (2002) argues that the relationship between ERP system and management accounting techniques used have not changed significantly. However, ERP system are considered to be an important data source for most new accounting practised, but not an incentive for accounting adoption[8]. In addition, according to Kaplan (1988) argues that one cost system is insufficient. Organisations need a system for each purpose. The same system cannot provide information for financial accounting, operational control and product cost measurement [11]. The characteristics of management accounting techniques are different in a number of ways such as allocations, frequency, precision, scope, etc.

AIS systems have been specific considering the importance of information quality in accounting and the profession's dependence on AIS systems (Xu 2000). This is important for any accounting firms to incorporate the IQ requirements during the system adoption process (especially in the cases of adopting a commercial AIS system, of which the system design cannot be altered).

Factor influence in AIS

The findings from the pilot case study indicated that adopting management accounting systems is important in an organisation, for it to support effective in business, decision-making and growth. AIS Adoption is affected by internal organisation such as the organisation behavior, organisation culture, business objective, policy, strategy, communication, size organisation, top management, system development, management support, and external organisation such as social environment, regulatory environment, legal environment, ethics and accounting standards—GAAP, TFASB, AARF, FASB, government agencies, IT

Governance, and comptroller general's department in Thailand. The result indicated that the impact of factor influencing AIS effort to develop accounting system to obtain competitive advantage and survive in today's global economy.

Information Quality

According to Wang (1998) and Kahn, Strong et al (2002), information quality has the critical aspect of fitness for use by data consumers; fitness for use requires that data must continually satisfy the needs of the user [10, 24]. Thus, information quality management is important in organisations, in order to support and develop different departments in corporations by enabling work processes of all sorts as well as decision-making. Moreover, according to Lee, Strong et al. (2002), organisations are highly concerned by the problems of their information quality. Organisations propose to improve information quality by identifying interdependencies between information and organisation processes. Thus, adequate information quality management must be discussed in relation to the existing business processes in organisations [2, 13].

Information Quality in AIS

Accounting and management decision making are concerned with the appropriateness of the AIS for the organisation's requirements for information communication and control [7, 14]. More specifically, accounting can be seen as important to the information quality and information system capacity to help business growth and increase profit. Furthermore, the accounting system and accounting information system require quality information and system processes in order to function effectively (as show in Figure 2).

Xu (2003) indicates that the element of IQ management is important to accounting systems' consideration in all processes of the AIS(Xu 2003). Moreover, the quality of the information provided is important to the success of an AIS. In particular, AIS require information quality management to improve work processes of all sorts as well as decision making. In order to ensure IQ in AIS, it is important to understand the appropriate IQ criteria specifically for AIS system [27].

Moreover, findings from Krishnan, Peters et al. (2005) show that the reliability of accounting data needs to meet organisation elements of information quality, to diagnose issues, and control the business [12]. In addition, AIS requirements legislated in the accounting standards have made data reliability assessment of great importance in organisations, particularly for accounting data. Also, accounting information requires improved quality of information to create and add value so that organisations become trustworthy and reliable. Therefore, organisations must pay attention to IQ management in AIS adoption, as it can add value to an organisation through actions that can be performed more effectively and efficiently.

Important IQ dimensions

In order to high quality information, it is important to identify IQ dimension as business requirements. IQ dimension is primarily an aspect of information quality which can help organisation to satisfy business objectives, and understand the requirements for delivering high-quality information [10]. According to Chutimaskul, Funilkul & Chongsuphajaisiddhi (2008), information quality has the characteristics of confidentiality, integrity, compliance, availability, effectiveness, reliability, and efficiency. These information quality characteristics are relevant to all data management processes adopted by individuals, corporations, governmental organisations, educational institutions, and virtually any other organisation [8].

Consequently, quality of information should be concerned with the efficiency to the user of the information. In the accounting management lifecycle, the utility of accounting information depends upon its potential to influence users' decision making [6].

Table 1. IQ Dimensions in AIS adoption

IQ Dimensions	Author
Relevance	Delone and McLean, 1992; Goodhue, 1995; Wang, Storey, and Firth, 1995; Jarke and Vassiliou, 1997; Kahn, strong, and Wang, 2002; Lee, Strong, and Kahn, 2002; FASB; IASB; AARF; SAC3; COBIT; ITIL.
Reliability	Delone and McLean, 1992; Goodhue, 1995; Wang, Storey, and Firth, 1995; Jarke and Vassiliou, 1997; Kahn, strong, and Wang, 2002; Lee, Strong, and Kahn, 2002; FASB; IASB; AARF; SAC3; COBIT; ITIL.
Effectiveness	COBIT; ITIL.
Efficiency	COBIT; ITIL.
Confidentiality	COBIT; ITIL.
Comparability	Delone and McLean, 1992; Jarke and Vassiliou FASB; IASB; AARF; SAC3.
Compliance	COBIT; ITIL.
Integrity	COBIT; ITIL.
Availability	Jarke and Vassiliou, 1997; COBIT; ITIL.
Understand ability	Zmud, 1978; Delone and McLean, 1992; Wang, Storey, and Firth, 1995; Jarke and Vassiliou, 1997; Kahn, strong, and Wang, 2002; Lee, Strong, and Kahn, 2002; SAC3; COBIT; ITIL.
Accuracy	Ballou and Pazer, 1985; Delone and McLean, 1992; Goodhue, 1995; Wang, Storey, and Firth,

IQ Dimensions	Author
Objectivity	1995; Jarke and Vassiliou, 1997; Kahn, strong, and Wang, 2002; Lee, Strong, and Kahn, 2002; Xu, 2003; Zmud, 1978; Wang, Storey, and Firth, 1995; Kahn, strong, and Wang, 2002; Lee, Strong, and Kahn, 2002.
	Delone and McLean, 1992; Wang, Storey, and Firth, 1995;
Accessibility	Jarke and Vassiliou, 1997; Kahn, strong, and Wang, 2002; Lee, Strong, and Kahn, 2002; Wang, Storey, and Firth, 1995; Kahn, strong, and Wang, 2002; Lee, Strong, and Kahn, 2002.
	Zmud, 1978; Ballou and Pazer, 1985; Delone and McLean, 1992; Wang, Storey, and Firth, 1995; Jarke and Vassiliou, 1997; Kahn, strong, and Wang, 2002; Lee, Strong, and Kahn, 2002; Xu, 2003.
Completeness	Zmud, 1978; Ballou and Pazer, 1985; Delone and McLean, 1992; Wang, Storey, and Firth, 1995; Jarke and Vassiliou, 1997; Kahn, strong, and Wang, 2002; Lee, Strong, and Kahn, 2002; Xu, 2003.
	Zmud, 1978; Ballou and Pazer, 1985; Delone and McLean, 1992; Wang, Storey, and Firth, 1995; Jarke and Vassiliou, 1997; Kahn, strong, and Wang, 2002; Lee, Strong, and Kahn, 2002; Xu, 2003.
Timeliness	1995; Jarke and Vassiliou, 1997; Kahn, strong, and Wang, 2002; Lee, Strong, and Kahn, 2002; Xu, 2003.
	1995; Jarke and Vassiliou, 1997; Kahn, strong, and Wang, 2002; Lee, Strong, and Kahn, 2002; Xu, 2003.

In this research, IQ dimensions are identified as relevance, reliability, comparability, understandability, availability, effectiveness, efficiency, confidentiality, accessibility, integrity, compliance, accuracy, objectivity, security, completeness, and timeliness, as identified from the literature and business requirements for information by pilot case studies, as shown in Table 1. These information quality criteria are relevant to all data management processes adopted by organisations.

A set of comprehensive essential dimensions of information quality for delivering high quality data has been determined as follows [24]: Intrinsic, Contextual, Accessibility, and Representational.

AIS adoption process

Fig 1 show that summary of case studies findings-AIS adoption process finding for pilot case study by different types of organisation as large public organisation, large private organisation to obtain a refined perspective on AIS adoption processes. The pilot case study was conducted to verify the framework developed to explore IQ management as related to organisational AIS. The AIS adoption process model show that the adoption of process management for accounting management systems is using technology-adoption to support operation, strategic

management, and decision making in the firm. The model reference framework defines 36 high-level control objectives for AIS adoption processes. These categories were identified as AIS System Selection, AIS System Implementation and AIS System Use.

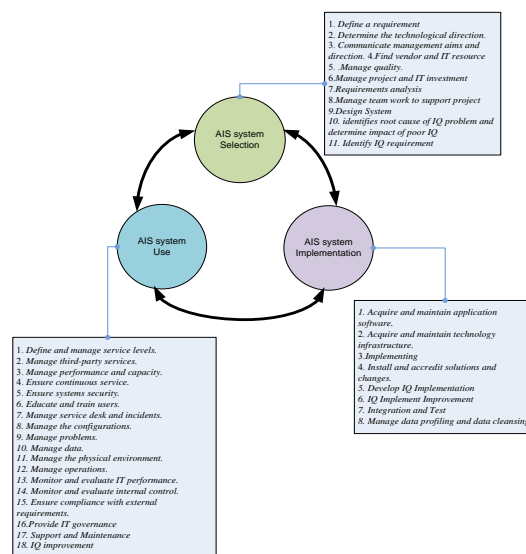


Fig 1 AIS adoption process model

Mapping the IQ dimensions into the adoption process

Several authors (e.g. Wang, 1998; Kahn, Strong at al, 2002) argues that IQ dimension is important role in influencing information quality. Base on this finding, Kahn, Strong at al (2002) indicates that IQ dimension is primarily an aspect of product quality or service quality. They were mapping the IQ dimensions into the PSP/IQ model to help ensure information quality benchmarks. In addition, according to COBIT framework indicates that information quality in adoption process used information quality dimensions into all the process of adoption systems. To satisfy business objectives, information needs to conform to certain control criteria, which COBIT refers to as business requirements for information quality.

Therefore, in this research, ties to identify the IQ dimension combines from IQ of IS and IQ of AIS (show in table 1) into the adoption processes (show in fig 1). Fig 2 show that adoption process and domain, of which IQ dimension is impacted by control objectives and business requirements. It is important to matching the IQ dimensions into individual adoption stages, the factors which impact information quality in adoption process have been identified from a literature review. In adopting AIS, IQ dimension is potential to influence decision making in each process adoption.

The proposed IQ in AIS adoption framework

With in framework, these elements of IQ issues are

important to researchers and are developed in the theoretical framework of this research which is shown in fig.2. Davila, Foster et al (2004) state that adopting management accounting systems is important in an organisation, for it to become effective in business, decision making, and growth. In accounting systems, adoption of an AIS is defined as using computer hardware and software applications to support operations, strategic management, and decision making in the business [8, 6, 12, 16]. However, AIS adoption is affected by internal organisation aspects and external organisation factors. Thus, it is important to understand the underlying factors that influence the AIS adoption.

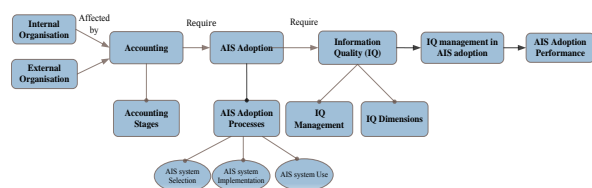


Fig. 2. IQ management in AIS adoption framework

In particular, accounting systems adoption requires quality information in order to function effectively, in which the level of information quality is critical for all accounting system processes. Information quality criteria are relevant to all data management processes adopted by an organisation. Thus, organisations need to apply information criteria to organize and control all stages of AIS and AIS adoption (shown in table 1). This framework links IQ management efforts to AIS adoption performance. The framework is developed based upon the existing literature review and the exploratory pilot case study.

Development of the Research Framework

The findings from the pilot study used together with the available literature to build the research framework, which was include the critical IQ factors derived from internal organisations as well as external organisations. The framework provides guidelines on how to ensure quality in AIS adoption. Fig.2 shows information quality management has a significant impact on decision making within AIS adoption. The initial exploratory research will also be used to re-design the interview protocol and data collection procedures, which will be used in the next stage.

The third stage will use case studies as confirmatory evidence, conducted as multiple case studies. The development of the case study methodology is recommended by Yin (2009), who suggests that the researcher must possess or acquire the necessary skills. Case study research design is also recognized by IS researchers as providing important contributions in case study design [29] which will be used in next stage.

1) Multiple Case Studies

The third stage of this research will be conducted as multiple case studies to validate results. A case study

protocol must be part of every case study project and must address issues such as project objectives, case study issues, literature and research. Field procedures include access to field sites, sources of information, location of those sources and a guide for the case study report. This study will use in-depth interviews with key stakeholders, conducted to examine the applicability of the proposed factors compared to the factors that impact information quality in AIS adoption in practice.

2) Case Selection

In this research, the selection of cases in this study was purposefully carried out in order to achieve theoretical and literal replication. Cases are selected containing the three dimensions: industry type, and the sizes and types of organisations. The first dimension, there are different types of business - agricultural, financial, industrial, education and government. The second dimension relates to organisation sectors, consisting of public and private groups. The third dimension focuses on the size of various organisations, especially large corporations and SMEs. The selected organisations are from Thailand but enable the dimensions to be addressed.

3) Data Analysis

According to Yin (2008), analysis of evidence achieved through investigation should be based on a general methodical strategy such as theoretical propositions or case description. The developments of the case study methodology are procedures for linking data to propositions and criteria for interpretable finding. In this research, data gathered from case studies will be qualitative. The qualitative data analysis methods will use pattern-matching, content analysis, and cross-case synthesis.

1. Pattern-matching analysis will use to logic approach compares an empirically based pattern with what is predicted to occur from all cases. If the patterns coincide, the results can help a case study to strengthen its internal validity [28].
2. Content analysis will use to enhance understanding of the data and natural phenomena from all cases. According to Elo and Kyngas (2007), indicate that content analysis is widely used in qualitative research techniques for describing and quantifying phenomena [5].
3. Cross-case analysis will use to gain insights into the factors from summaries and analyses of the findings from all cases. According to Yin (2008), the emphasis on data demonstrates assists in ensuring transparency, and the results of the synthesis are likely demonstration to be capable of being readily converted to qualitative variables.

Findings and Discussion

Base on finding from literature, AIS is specific

software application and manage process. Finding from Kaplan (1998) indicate that enterprises should be operated management accounting outside the ERP system because the same system can not provide information for financial accounting. What's more, Malmi (2001) and Scapens and Jazayeri (2003) find that the relationship between ERP system and management accounting techniques used have not changed significantly. However, ERP system are considered to be an important data source for most new accounting practiced. The characteristics of management accounting techniques are different in a number of ways such as allocations, frequency, precision, scope, etc.

Moreover, according to Rom and Rohde (2007) indicate that data integration in accounting should be studied more narrowly and specifically. And also several authors (e.g. Davila, Foster et al, 2004; Naomi and Kevin, 2007; Ismail, 2009; Romney and Steinbart, 2009) state that in organisation must be attention under accounting standard and law each country [3, 9, 22].

In particular, recently when adopting AIS, some organisation used AIS vendors for adopting accounting systems by the software vendors to the organisations who want to adopt their solutions. Other organisation used generic framework adoption by COBIT, ITIL, and SDLC to guideline on how to select and adopt AIS systems, but no specific for AIS adoption.

Finding from literature, most of the research concerning AIS has focused on the management of internal controls, design of an accounting information system and auditing [2, 17]. Few studies have attempted to understand how to choose and use (adopt) AIS systems well, in organisations, to meet all IQ requirements.

Interestingly, IQ management specific to AIS adoption is a new area, there is a growing need for research to provide insights into issues and solutions related to IQ management in AIS adoption. A number of generic IQ frameworks have been proposed in the literature, but none of them has actually looked into the area of AIS adoption. There is a lack of knowledge and of a standards framework for information quality management in accounting information systems adoption that can assist organisations to ensure and improve accounting information quality

Conclusions

This research provides the overview of the studies that have been discussed in the literature and propositions based on the evidence. In order to implement this research, it will be necessary to conduct case studies and collect information from the user's perspective by interview. In addition, an AIS adoption specific IQ framework will be developed, drawing on the substance of knowledge linked to IQ management in terms of AIS adoption by organisations.

A preliminary theoretical framework for information

quality management in accounting information systems adoption was developed in this research after a detailed literature review and two pilot case studies. Based on this framework two research questions have also been developed. These research questions will be investigated by using theory building and testing research methodologies described in further research.

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THE EFFECT OF E-CHANNEL STRATEGY ON FIRM MARKET VALUE

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ABSTRACT

E-channel has advantages over traditional market channels. This paper employed event study methodology to discover the effect of the e-channel strategy on firm's value by the data from e-channel announcements from 2008 to 2010. We developed a research model to study the stock market reaction to e-channel investment, and to verify whether the e-channel type, product type, firm already has e-channel or not, network type, can moderate the relationship between e-channel announcement and firm market value. the details of event methodology and the research design were introduced in detail. Finally, we concluded this paper with the expected results.

Keywords: E-Channel, Event Study, Firm Value.

INTRODUCTION

Around two thirds of cyber citizens are online customers in the US, Europe and Korea. The Internet has a full potential to fundamentally change the structure of marketing channels, if consumers choose to adopt electronic market channels. Electronic channels or e-channels use the Internet to make products and services available so that the target market with access to computers or other enabling technologies can shop and complete transactions for purchase via interactive electronic means (Kevin 2002). Facing with this huge latent market, more and more firms are willing to invest in setting up e-channels.

If firms decide to develop or operate an e-channel by themselves, their investments include computers, software, operations and maintenances. Besides, finding required on the subsequent channel promotion and other services is always much more. Just as Gartner Group estimates that firm creating e-commerce site spend \$1 million in the first five months, and \$20 million for a place in cyberspace competition (Diederich 1999).

With the significant opportunities in growing of online customers vs. enormous investments, a question should be asked, that is "Does e-channel investment really increase firms value?" And if it does, how the value can be assessed?

Nowadays, online markets and competition among these markets change rapidly. Customers have many choices on which online shops to buy

from. Competitions go beyond just selling end products and services, but also providing value added services such as media advertisements, electronic payment, third-party certifications and product reviews, through e-channels. The relative advantages of e-channels can be conceptualized as a multidimensional construct, perceived relative merits of channels with three dimensions namely, convenience, trust, and efficacy of information acquisition (Choudhury and Karahanna 2008).

Though we can assess firm value change from accounting-based measures of profit, it was criticized because they don't often indicate the true performance of firms. For example, the profit can be manipulated by different accounting procedures (McWilliams, 1997). Even it is not controlled by the firm managers, it is difficult to isolate the effect of e-channel strategy from other business activities effects. We may use empirical study to assess the e-channel performance, which often use questionnaire to collect data. But the limitation is the firm data was self-reported by firm staff, it could induce certain biases.

In order to eliminate the above limitations from using the data inside firms, we apply event study to evaluate the firm value changes. The event method is a powerful tool that can help researchers assess the financial impact of changes in corporate policy (event). It is based on stock price changes to measure the financial impact of a change in corporate policy. In an efficient capital market, investors are assumed to collectively recognize future benefit streams accruing from initiatives announced by firms, a judgment subsequently reflected in the stock price of the firm (Mani Subramani, 2001).

Researcher determines whether there is an "abnormal" stock price effect associated with an unanticipated event, then infer the significance of the event (McWilliams, 1997). This methodology is well accepted and has been used to study the effect on the economic value of firm actions such as IT investments (Dos Santos, Pfeffers 1993), corporate acquisitions (Chatterjee 1986), takeover bids (Jarrel and Poulsen 1989), celebrity endorsements (Agrawal and Kamkura 1995), new product introductions (Chaney et al. 1991), e-commerce (Mani Subramani, 2001) and supply chain disruptions or glitches (Hendricks and Singhal 2003, 2005).

In this paper, we employ event study methodology to discover the effect of the e-channel initiatives on firm market value. We use data on e-channel announcement by firms in the period from 2008 to 2010.

The rest of this paper is organized as the following: First, we review previous related studies on e-channel/e-commerce/IT. We then present a preliminary research model with hypotheses on the relationships between e-channel announcement and firm value. Thirdly, the event study methodology is described in detail. Data collection and sample selection are also presented. Finally, we conclude with the expected results of this study.

LITERATURE REVIEW

Event study is not a newly applied in e-channel investment performance related studies. Except widely used in finance and accounting field, it is already used to discuss the market reaction to the event in IS field.

Subramani and Walden (2001) undertook a study of 251 e-commerce initiative announced by firms between October and December 1998. It discussed the returns to shareholders in firms engaging in e-commerce, and compared the returns to e-commerce in conventional and net firms, the B2C and B2B, digital goods and tangible goods. The results showed that e-commerce initiatives do indeed lead to significant positive CARs for net firms, while there was no significant difference between conventional and net firms. The CARs for B2C announcements were higher than those for B2B. Also, the CARs with respect to e-commerce initiatives involving tangible goods were higher than for those in digital goods.

Even it presents the first test of the dot com effect; discussion on variation of abnormal returns was not involved in their study. It may decrease the feasibility of the research results. In addition, the research period is a specific condition. The last quarter of 1998 is a unique bull market period and the magnitudes of CARs (between 4.9 and 23.4% for different subsamples) in response to e-commerce announcements were larger than those reported for other firm actions in prior event studies.

Further, as time goes by, the e-commerce competition situation has been changing. During the research period of the last quarter in 1998, B2B e-commerce model need buyer-supplier arrangements using EDI technologies to web-based interaction, and at that time it is difficult in establishing effective management processes in inter-organizational relationships

observed by prior researchers (Hart and Saunders 1997, Henderson and Subramani 1999). In late 1998, B2C commerce received far greater attention in the media than B2B, also, as retail investors may have played a dominant role in the trading of technology stocks in this period (Smith 1998). So the risks in technologies and management lead investors to view B2B with lower returns than B2C.

For our study, the issue e-channel is different from e-commerce, or we can view it as one part of e-commerce, especially nowadays the e-commerce actions are complicated. E-channel emphasizes the efficiency to deliver products to customers by Internet. In addition, we choose different period (from 2008 to 2010) to study the e-channel effect, the IS related technologies are accepted by more and more firms, so the interaction of the firms will be easier, and there are some collaboration of firms successfully of establishing e-channel. Recently fierce competition in online market also makes the different explanation of the abnormal return.

Similar to other e-commerce or IT initiatives, e-channel implementation requires investment. In fact investment for e-channel establishment would be enormous. It includes the IT investments and management or operation investment, such as channel promotion and various services. As for the IT investment effect was already discussed by some researchers. Dos Santos et al. (1993) examine the stock price reaction to IT investment announcements in the context of two explanatory variables, industry and innovation. Dos Santos et al. did not find any significant effects for financial firms; they did find that innovative IT investments were related to positive, abnormal stock price returns. Im et al. (2001) discussed the stock market reaction to IT investment in the context of three explanatory variables: industry, size and time period. The results showed that the abnormal returns to IT investment announcements were in fact related to the above three variables. Chatterjee et al (2002) argued that IT infrastructure investments will induce a positive, abnormal market reaction. To some extent, these literatures will provide the related empirical support for e-channel investment effect, but the components of e-channel investment not only includes IT or equipment investment. And the market investors' consensus on the expected benefit of e-channel may different from the earlier stages of e-commerce.

Hence, our study results or discussion will be different from the prior related studies. It is also the value of our study possibly lies in.

RESEARCH MODEL

The research model of this paper is depicted in Figure 1. As empirical evidence and related literatures suggest that e-channel can bring more latent customers and enlarge the market share for firms, the relationship of e-channel and the market value of firm is described as: firm announcing E-channel will positively affect the market value of firm, or the abnormal returns attributable to e-channel announcements are positive. It offers a baseline for overall research in this paper, but not a central contribution. We focus on the factors that will moderate the relationship and explanation for abnormal returns.

There are various e-channels: the company set up its own website to form an e-channel, open its shop on third-party online platform. Is there any difference between these subsamples? The firms engaging the e-channel can be conventional firms without e-channel before, they also includes the firms which already has e-channel, during our research period the e-channel they announced was a new one, not an initiative one. Besides this, there is the new e-channel application during this period, such as mobile commerce. Similarly, is there any difference between them? That is to say, the above factors: e-channel type (self-develop platform or third-party platform), product type (tangible goods or services), firm already has e-channel or not, network type (Internet or mobile Internet), can moderate the relationship between e-channel announcement and firm market value.

As for the explanation for the abnormal return, we will perform multiple regression analysis. The independent variables, such as firm size, industry, time period, these common variables discussed in related event studies, should be considered.

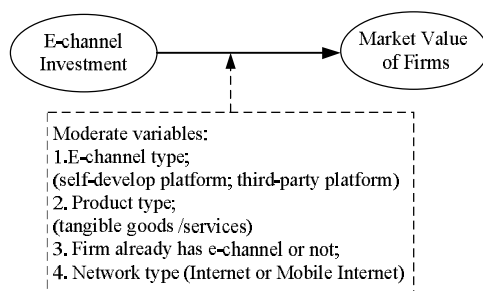


Figure 1. Research Model

RESEARCH METHODOLOGY

We will use event study and the core methodology for this research. The event methodology is developed to measure the effect of an unanticipated event on stock prices, that is calculate the return due to the event, which is called abnormal return. It equals to the actual

return minus the expected return without the announcement (normal return). So the standard approach is based on estimating a market model for each firm and then calculating the abnormal return. There are not one model to computer the normal (market model, market-adjusted model and mean-adjusted model), in this paper, we briefly introduce the market model which is the best specific model controls for the systematic risk of the risks. This model posits a linear relation between the return on a stock and return on the market portfolio over a given period (estimation period) as:

$$r_{it} = \alpha_i + \beta_i r_{mtt} + \varepsilon_{it} \quad (1)$$

r_{it} is the return of stock i on Day t ; r_{mtt} is the market return on Day t ; ε_{it} is the error term; α_i is the intercept term; β_i is the systematic risk of stock i .

Then the Abnormal return for stock i on Day t is the difference between r_{it} (actual return) and $(\alpha_i + \beta_i r_{mtt})$ the normal return (expected return) for stock i on Day t .

$$A_{it} = r_{it} - (\alpha_i + \beta_i r_{mtt}) \quad (2)$$

Where α_i, β_i are the parameter estimates of α_i, β_i .

For stock i , we use OLS (ordinary least squares) to estimate the parameter α_i, β_i from the regression of r_{it} on r_{mtt} over an estimation period.

As for the length of the estimation period, it should more than 40 days suggested by literatures. in order to prevent any potential bias, the data used to estimated the parameters of the market model must be isolated from the impact of the event itself, so it should close to the event period but not include the event period. Thus, a short time period of 10 trading days is typically used to separate the estimations and event periods. Each firm's estimation period ended 10 trading days prior to the announcement date. Generally, estimating two parameters with less than 40 is not statistically sound.

For this study the market portfolio is the equally weighted index of all securities traded on the New York, American and Nasdaq stock exchanges. Though the above statistical method can be used to test the significance of abnormal returns, and prevent some biases, it is well established that the usefulness of event study method depends heavily on a set of rather strong assumptions. (Brown &

Warner 1980,1985). Additionally, research design issues affect the results with the framework (McWilliams, 1997).

Assumptions of Event Study

Readers can be confident that the conclusions from an event study are valid only if they can be confident that the researcher has truly identified the abnormal returns associated with the event. The inference of significance relies on the following assumptions: Markets are efficient; The event was unanticipated; There are no confounding effects during the event window.

Market Efficient

Market efficiency implies that stock prices incorporate all relevant information that is available to market traders. If it is true, then any financially relevant information that is newly revealed to investors will be quickly incorporated into stock price. Then a researcher can identify significant events by their impact on the stock prices of firms. (Bromiley, Govekar and Marsus 1998)

Unanticipated Events

The market previously did not have information on the event, and traders gain information from the announcement. Then the abnormal returns can be assumed to be the result of the stock market's reacting to new information, or the use of the event study methodology will be problematic.

Confounding Effect

The third assumption is based on the claim that a researcher has isolated the effect of an event from the effects of other events. Confounding events can include the declaration of dividends, announcements of an impending merge; sign of a large damage suit, announcement of unexpected earnings, and change in a key executive. Any of these events might have an impact on the share price during an event window.

Therefore it is appreciated to use this method when these assumptions are likely to be valid. The third assumption is critical, because the method, by definition, attributes the abnormal return to the event under consideration. If other financially relevant events are occurring during the event window, it is difficult to isolate the impact of one particular event.

RESEARCH DESIGN FOR EVENT STUDY

In this study, we define an event as a public announcement of a firm's e-channel initiative in the media. We will collect data using a full text search of company announcements related to e-commerce in the period of 2008 to 2010. Two

leading news sources; PR Newswire and Business Wire will be used. A keyword string, "launch or open" and "product or service" and "online shop or store" or "e-channel or electronic channel or e-commerce or electronic commerce" is used to search for relevant announcements.

To avoid potential unanticipated events, sample firms we select should have an announcement of a new e-channel initiative or the extension or expansion of an existing initiative. The event date is the first time e-channel related announcement. To avoid confounding effect, the news contains the information about expected earnings, personnel changes, and strategic partnerships will be discarded. As for the market efficiency concern,

- i. newly listed companies will be dropped, because they do not have a trading history of 120 days prior to the event date. There is no sufficient data to estimate the normal return of this firm.
- ii. companies with average stock price less than \$1 in that period will also be eliminated, because the price changes in these companies tend to be unrepresentative of the broader market.
- iii. companies with average daily traded stock volume less than 50,000 shares in the period should be dropped, as the efficiency of the market is likely to be questionable with small trading volume.

Sample Size

Sample size is a concern because the test statistics used in the event study framework are based on normality assumption associated with large samples. Small samples are quite common in the management literature; especially then events are disaggregated along many dimensions. "Bootstrap" method may need be used to relax the normality assumptions (Barclay & Litzenberger 1988, McWilliams and Siegel 1997).

Nonparametric Tests to Identify Outliers

The test statistics employed in event studies tend to be quite sensitive to outliers, and a small magnifies the impact of any one firm's returns on the sample statistic. Hence, with small samples, interpretation of significance is problematic. It is suggested that eliminating the outliers is a drastic approach, because it is possible that outliers provide an important signal of the existence of confounding effects. One important control for outliers is for researchers to report nonparametric test statistics. One approach is binomial Z statistic, which tests whether the proportion of positive to negative returns exceeds the number expected

from the market model. Another nonparametric statistic to report is Wilcoxon signed rank test, which consider both the sign and the magnitude of abnormal returns (Kohler 1985).

Event Window

There are two problems with the event study on long event windows, as Brown and Warner (1980, 1985), using a long event window severely reduces the power of the test of statistic Z_t . The reduction leads to false inferences about the significance of an event. In addition, it has been empirically demonstrated that a short event window will usually capture the significant effect of an event (Ryngaert & Netter, 1990). Since it is very difficult to control the confounding effects when long windows are used, and event window should be as short as possible. It should be long enough to capture the significant effect of the event but short enough to exclude confounding effects. So it is suggested that the lengths of the event windows used should be justified.

Confounding Effects

There are methods that allow researchers to control for confounding events. Foster (1980) discussed several of them, such as : eliminating firms that have confounding events; partitioning a sample by grouping firm that have experienced the same confounding events; eliminating a firm from the sample on the day that it experiences a confounding event; subtracting the financial impact of the confounding event then calculating the abnormal returns.

Explanation of Abnormal Returns

After determining the significance of the CARs, in a second stage of the analysis, a researcher should explain the normal returns by showing that the cross-sectional variation in the returns across firms in consistent with a given theory. For example, the theory may predict that there should a positive correlation between the size of the abnormal returns and the extent of firm diversification. Thus, in the second stage of the analysis, the researcher should regress the abnormal returns on some measure of firm diversification and report the parameter estimates. According to the assumptions and important research design issue, we will conduct the event methodology as the following steps:

- i. define the e-channel announcement that provides new information to the stock market;
- ii. use related theory to justify the financial response to e-channel announcements;
- iii. identify the event dates of the firms that experienced the e-channel event;

iv. choose an appreciate event window, and if it exceeds 2 days, justify its length;

v. identify the confounding effects;

vi. compute abnormal returns during the event window and test significance;

vii. outline appropriate theories to explain the cross-sectional variation in abnormal returns.

EXPECTED RESULTS

We use the data of the sample firms to calculate the CARs and test its significance. Considering the market situation changed, the investor's consensus expected reactions to the e-channel announcements will be different from the result in the prior event studies on related event studies. We possibly couldn't find the significant positive effect in the relationship between the e-channel initiatives and firm market value. When facing with this seemingly unexpected results, it exactly the opportunity for us to further understand the investor's different views on this business action, and the really value of enthusiasm in the investment and financing in e-commerce fields.

As for the moderate variables effects, we think there is no significant difference in abnormal returns between products and services; the firms that already have e-channel may experience higher positive abnormal return for those firms just involved in, because the former have the more successful experiences, and learning effect will enhance the capacities necessary in online market; the abnormal returns attributable to e-channel via mobile internet also may higher, because mobile phone is more convenient and interactive, which can exhibit the advantages of e-channel.

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DRIVING THE BUSINESS SERVICE-ORIENTED ARCHITECTURE ENABLED INITIATIVE

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ABSTRACT

Service-oriented architecture (SOA) continues to gain interest and deliver its business value as so many organisations are forced to integrate increasingly diverse legacy systems and complex application environments. Organisations are moving towards implementing SOA initiative to become business SOA-enabled for reducing complexity and increasing business agility. Driving the initiative of SOA into business requires a set of requirements in order to successfully implement SOA. These requirements are four fundamentals of SOA initiative with associated seven elements of SOA which have been discovered via thoroughly literature analysis. A model therefore is proposed for businesses to understand how to implement and run SOA to actually achieving benefits from their SOA initiative.

Keywords: Service-Oriented Architecture, SOA, SOA Initiatives.

INTRODUCTION

Most organisations today have enabled their business processes with information technology and thus they have viewed service-oriented architecture (SOA) as part of the technology where business processes are implemented as services [43]. However, it is more than this. It is a business philosophy and approach in organising the business and its processes because SOA needs vary from one organisation to another [8][45]. Thus, the importance of articulating this business philosophy is to enable businesses to operate and collaborate entirely in a new business concept. It makes it easier for business people to understand and manage even where there are changes in business conditions without having to rebuild the system [35].

As service-oriented architecture becomes prominent within the information technology (IT) marketplace, many organisations are quickly becoming SOA-enabled by having initiatives to implement SOA [44]. Implementing SOA initiative requires a comprehensive initiative plan to organise the business and its processes effectively [34]. SOA initiative is where

organisations implementing SOA successfully through a step-by-step process with a reference implementation that demonstrates the recommended use of standards and best practices [46]. The initiative plan is essential for an organisation that is willing to move forward and succeed in business. Thus, an organisation should employ or create a suitable workable plan for transforming business processes to SOA that quickly respond to business change.

Many major IT vendors have embraced SOA due to the enormous potential of SOA. Indeed, two recent Forrester research reports on preferred SOA vendors by customers evaluated that the top SOA vendors are providers such as IBM, BEA Systems, Software AG, SAP, Oracle, TIBCO and Accenture [26][56]. In this review of the literature, the SOA solutions from these vendors were analysed comprehensively together with relevant literatures to obtain common elements and fundamentals that can employ to implement SOA initiatives into an organisation.

This paper is structured as follows: the first part describes the background of SOA initiative based on relevant literature. The second part is the main focal point in presenting the model for SOA initiatives. Finally the paper draws a conclusion.

IMPORTANCE OF SOA

With the evolution of information technology, communication through the Internet has been used widely to establish business relationships by having business-to-consumer interactions and business-to-business collaborations [1]. The message of communication as regards information is emphasised as an asset to an organisation [42] which will grow and become rich together with ideas and knowledge when collaborating and interacting between people. This important asset should be fully-utilised and maximise its potential value to drive organisations to implement SOA [8]. In fact, consulting companies disclose that the implementation of SOA initiatives to industry have been constantly adopted [18]. This is supported by a recent Gartner report; nearly 60% of the software market for SOA will grow by 2011, which shows an impressive growth in the implementation of SOA

initiative in organisations [12].

Organisations' views on information are changing, when realising the importance of SOA. About 74% of recently surveyed organisations have plans to deploy or are already deploying SOA [17]. Even organisations investing extensively into SOA, measuring business value and return on investment (ROI) are believed to seek outcomes which are still possibilities not probabilities [7]. SOA will be the key to business success and innovation through its benefits of flexibility, speed and simplicity [39]. Utilising SOA will achieve business goals and objectives successfully without changing the underlying applications but leveraging services with a flexible infrastructure [41] and thus, controlling the integration costs [43]. SOA facilitates business users in their working environment within or across organisational boundaries by integrating other applications to develop and support dynamic, complex, and collaborative business processes [28][37].

Understanding the value and importance of SOA as well as its essence will enable organisations to be more flexible and agile in business processes [32]. This flexibility and agility will allow IT to ease integration and react to changes in technologies and business requirements [33], which enhances business effectiveness and efficiency. Therefore, SOA offers important keys to business growth and success by providing solutions for both business and IT environment.

SOA BUSINESS VALUE

Many organisations perceive their SOA initiatives will increase their business value. Recent surveys from Forrester research show organisations initiatives in implementing SOA as a business enabler are rapidly increase [25]. This means that organisations everywhere are turning to SOA to bridge and align IT initiatives with business goals. Furthermore, many chief information officers (CIO) lead to change the existing business infrastructure with modern and flexible technology [21]. This is supported by recent Gartner research where organisations SOA initiative able to grow revenue and achieve positive returns which usually takes 10 months [48].

Consequently, there are three main concepts in terms of compatibility, complexity, and discrepancy (see Figure 1) for building on SOA for greater and positive business value and thus, implement SOA initiatives [6]. Compatibility means legacy applications can be integrated and compatible with SOA [4]. Complexity means the ease of use of SOA across organisation which

associated with governance [58], technology and organisational change [59]. Discrepancy means organisations achieve flexibility, reliability and upgradability from SOA [30] lead to perceived needs on top of the benefits obtained from existing technology. But, flexibility is the most important driver for SOA [25].

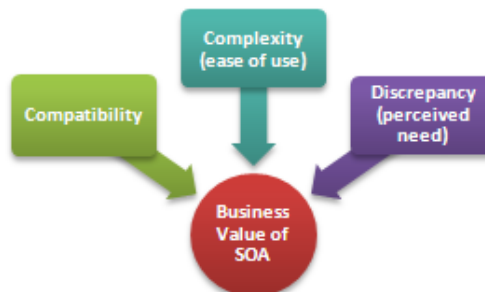


Figure 1: Main concepts – SOA business value [6]

With this concept in place, organisations can extend their business value in a way that SOA extends the life of legacy systems by fitting into current capabilities, goals and priorities. Furthermore, SOA provides benefits to businesses through its implementation that is capable to support current infrastructure as well as applications and to deliver more effectively in response to changing market conditions [31][57]. Thus, with available resources, implementing SOA initiative that helps organisations to be more agile and flexible in-line with business objectives and processes in the face of changing market demands is the ultimate business value.

METHODOLOGY

The research methodology for this study consists of five steps (see Figure 2).

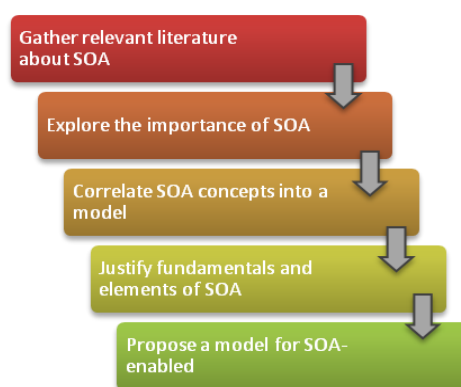


Figure 2: Research methodology

First, the background information about service-oriented architecture and relevant information are gathered by searching the existing literature such as journals and academic conference proceedings. In addition, industrial papers like white papers from SOA vendors are searched for review. Second, we explored the importance of SOA to business by summarizing

the information that was gathered. Third, the SOA concepts were correlated into a model. Fourth, the fundamentals and common elements were justified as key important in having SOA initiative. Finally, a model for business SOA-enabled initiative is proposed based on the study.

PROPOSED MODEL

After analysing the reviewed literature, four fundamentals of SOA have been identified: maturity, technology, governance and change management. In addition, the elements of building SOA have been discovered that consists of seven elements: services, business requirements, organisational, roles and responsibilities, technology infrastructure, standard requirements and tools. Figure 3 shows the proposed business SOA-enabled initiative. If a business employs this model, it may improve the initiative of SOA implementation, which in turn will lead to become business SOA-enabled organisation.

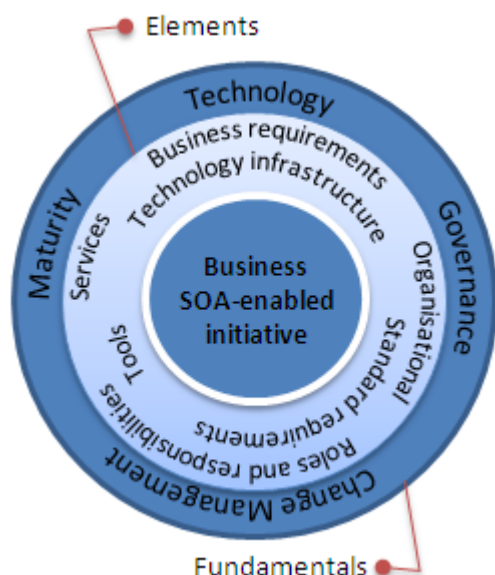


Figure 3: Business SOA-enabled initiative model

Following subsections, the fundamentals and elements of SOA initiative are discussed in detail.

Fundamentals of SOA Initiatives

There are four fundamentals for SOA initiatives in order to identify and support the business strategy requirements towards implementing successful SOA [5]. The fundamentals are maturity, technologies, governance and change management which is described next.

Maturity

Current maturity of an organisation can be evaluated by using maturity models within the IT field. A recent study determined two distinguishing maturity models namely 'process maturity model' and 'stage maturity model' [55]. The most well known process maturity model is

the Capability Maturity Model Integration (CMMI) developed by the Software Engineering Institute at Carnegie Mellon University and which focuses at controlling and improving the quality of software development processes [14] whereas a stage maturity model is used to benchmark IT adoption within an organisation [55]. Thus, SOA maturity model is one of the examples for stage maturity model where it used to measure the current state of SOA adoption of an organisation [29].

There are many SOA maturity models available from large IT vendors such as IBM, SAP and Oracle. Thus, with these maturity models, SOA analysis and development is approached in somewhat different ways according to the level of maturity such as a solution for organisations' initiative that has supportive roadmaps, guidelines and framework to coordinate the different paths to SOA internally or across organisations [49]. This section will explain briefly the SOA maturity model [2] that is widely adopted in the literature as shown in Figure 4.

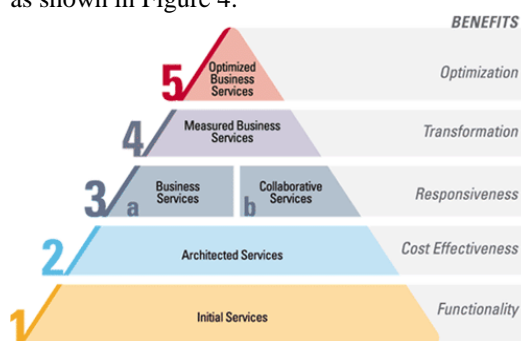


Figure 4: SOA maturity model [2]

This SOA maturity model has five levels of maturity: initial services, architected services, business and collaborative services, measured business services and optimised business services, along with their benefits. The lower levels of maturity; level 1 and 2, are the starting point where it is a learning process phase which benefits from functionality to cost effectiveness of an organisation. In upper levels of maturity; level 3, 4 and 5, an organisation become optimised and matured by providing clear business responsiveness, transforming services to real-time business and optimising services to react and respond automatically.

Technology

Various technologies and concepts related to SOA give agility to organisations and allow flexibility in business processes depending on the business and system requirements. In order to achieve these benefits, organisations working on specification related to web services [3]. This widely used technology is come from web

application technology [24] to support the realisation of organisations' SOA vision. It is based on broadly adopted standards (refer to Table 1) such as XML language [23], WSDL, SOAP and UDDI [33][50]. In addition, the technology of web services together with enterprise service bus (ESB) and service registry makes a SOA real [9][24].

Table 1: Standards for SOA [33]

Standards	Abbreviation	Description
XML	eXtensible Markup Language	Fundamental to web services that provides a way to describe information.
WSDL	Web Services Description Language	Used to describe WS interfaces, which define operations and then binds them to one or more protocols.
SOAP	Simple Object Access Protocol	Defines an envelope and rules for representing information sent in that envelope. SOAP messages are commonly conveyed using HTTP.
UDDI	Universal Description Discovery and Integration	Stores registrations describing WSs and provides unique names for elements in the registration.

Other possible implementation technologies include Object Management Group CORBA, Java RMI, .NET Remoting, email, Message-Oriented Middleware (MOM), TCP/IP, DCE, JINI/JS, OSGi, or MQSERIES [5][51]. In addition, SOA should support several standardisations bodies with a great involvement of industry, such as World Wide Web Consortium (W3C), Organisation for the Advancement of Structured Information Standards (OASIS) or Web services Interoperability (WS-I). An industry effort by IBM, SAP and Oracle-BEA or alternatively, an open source by JBoss, RedHat where they are also SOA vendors are influencing in the SOA technology which is likely incorporate support for SOA development into their products [22].

Consequently, implementing SOA initiatives lead to the development of more set of technologies and the challenges of building SOA especially related with interoperability, integration complexities and conveying to industry standards,

influence today's approach to SOA development. Enabling these technologies allow SOA to operate reliably and securely in support of business objectives and enable to leverage existing IT infrastructure as well as legacy systems to support SOA goals [34].

Governance

Governance is simply about decision and accountability that involves the processes and policies of both business and information technology [47][52]. As organisations are dependable on IT infrastructure, IT governance is needed for consistent management and coordination [40]. Thus, IT governance and service-oriented architecture governance are interrelated. In an SOA, governance has become imperative taking control of the stability of services to retain its reliability within an acceptable service level [29].

A generic SOA governance model, named SOA Governance Control Cycle (SGCC) that has constructed based on the comparison of a number of existing SOA governance models [40] is explained further in brief. This generalised SOA governance model is a straightforward iterative cycle that consists of four phases; planning, design, realisation and operation as illustrated in Figure 5. It is simply to realise the benefits of SOA by managing and assisting SOA.

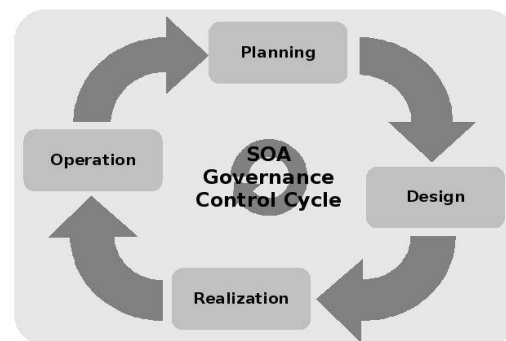


Figure 5: SOA Governance Control Cycle [40]

These phases are in sequence that involves governance activities and processes. The first phase is when the initial governance framework is planned where all SOA requirements, processes and activities are defined as well as roles and responsibilities. Followed by the second phase where SOA policies and metrics are designed for implementing successful SOA based on business and technical requirements. Next, the governance process begins in the third phase by realising all processes and activities defined in the previous phase as well as enforcing policies and metrics. In the last phase, SOA governance processes are evaluated and analysed for their effectiveness. The new cycle is then initiated when addressing

new changes and challenges.

Change Management

Every organisation is aware of the technological change as it often implies risks and how it may impact their businesses [5]. Change is necessary for organisation to minimise those risks of unforeseen challenges and stay competitive in a challenging business environment. Managing the change is not easy but there are ways to deal and make the change easier and to provide an efficient management. One way is to have the SOA initiative for people and for organisation to gain business agility and IT flexibility that SOA offer which is very compelling as it addresses the changing business requirements and marketplace [16][54].

While changes are inevitable that affects the way of doing business, it is an important task related to change management procedures to ensure SOA reflects the updated business processes and fulfills its promise of agility and flexibility. Thus, management tasks and capabilities are needed to accommodate these changes by defining policies; establishing new guidelines and practices; creating implementation plan; restructuring roles and responsibilities; and monitoring operations [5][16]. More importantly for change management however, is to have SOA governance steering committee that comprises of business and IT personnel, who articulates the business strategy, goal, and vision from the beginning of SOA initiative process [38].

Elements of SOA

SOA bridges two worlds; business and IT. It is really important that IT infrastructure can change in pace with changes in the business environment [36]. This can leverage business agility and flexibility. The SOA model comprises a number of elements needed to ease the capacity of SOA services to change to meet new business requirements. These elements are described in the following subsections.

Services

The most common services in SOA are web services [53]. It is a set of services that are highly interoperable, representing business processes to address business needs at minimum cost and with minimum delay [11]. These web services can provide access on various platforms and can be reused more easily across multiple applications. Normally, web services are configured and composed to meet business requirements set by business analysts with business users [8].

Business requirements

In SOA, business requirements are necessary in

order to develop services which are able to respond to business change [19]. These requirements identify the needs of business in order to help improve business processes and optimise the use of IT. It can be divided into two approaches – reactive and proactive [34]. The reactive approach enables organisations to identify problems that cannot be resolved immediately whereas a proactive approach helps organisations to predict change and thus minimise the risks of unforeseen challenges.

Organisational

Implementing SOA initiative with a focus on the organisational factors becomes increasingly critical [27]. SOA requires organisational flexibility to its business environment with positive attitude to change and trust in business services across the organisation and support for corporate legal aspects and policies in order to maintain alignment with business priorities and practices [15].

Roles and responsibilities

An individual or a group involved directly in implementing SOA initiatives are those who can lead or drive successful SOA rollouts [8]. The roles include – but not limited to – CIO, chief architect, line-of-business executives, senior architects and IT managers that can be either business oriented or technical (but having an understanding of both is better).

Technology infrastructure

Various hardware – including servers and network devices; software including applications and middleware – need to be fully defined to suit the business needs of an organisation by determining the service volumes, performance and capacity of hardware and network [10]. The technology can be purchased from IT vendors such as IBM, SAP and Oracle or alternatively, an open source by JBoss, RedHat.

Standard requirements

These requirements are also as important as business requirements to ensure that technologies support organisation operations. Thus, having a list of standards that can be broadly adopted such as XML, SOAP, WSDL, UDDI and HTTP is needed to build interoperable web services [50]. The common standards are SOAP 1.1, WSDL 1.1, WS-I Basic Profile 1.0 or 1.1, UDDI 3.0.2, WS-Security 1.0 or 1.1, WS-BPEL 2.0, BPMN, WSRP 1.0, XML Schema 1.0, XSLT 1.0, XPath 1.0, XQuery 1.0, XML Signature and XML Encryption.

Tools

SOA tools are employed in implementing SOA

initiatives into an organisation which are introduced by most IT vendors such as IBM, SAP and Oracle. The review identified four common elements – maturity model, governance, security and quality. A maturity model is used to evaluate the current SOA maturity of an organisation [29]. Governance is simply concerned with decision-making and accountability that involves the processes and policies of both business and IT [47][52]. Security is necessary as SOA is being practiced within the openness of web services [20]. And applying quality on web services can provide better quality of service (QoS) [13].

CONCLUSION

Service-oriented architecture is vital focus for any organisations to adopt by having SOA initiative to improve their business. In this paper, we have discussed the four fundamentals of SOA initiative: maturity, technology, governance and change management. Under these four fundamentals, important elements that should be considered when implementing SOA are services, business requirements, organisational, roles and responsibilities, technology infrastructure, standard requirements and tools.

Based on both SOA fundamentals and elements, we have proposed a model for implementing successful SOA initiative in an organisation with high agility and flexibility. The model can be used as reference guideline when considering implement SOA initiative. Further work is required in which we intend to study issues and challenges of SOA initiative by conducting case studies and will result in proposing a comprehensive framework to implement SOA initiative better. In conclusion, the SOA fundamentals and elements are playing an increasingly important role in implementing business SOA-enabled initiative because SOA offer business value and are therefore central in determining the successful SOA implementation.

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EXPLORING SOA'S POTENTIAL FOR BUSINESS PROCESS OUTSOURCING

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ABSTRACT

Business Process Outsourcing (BPO) represents an organizational change which results in an e-Business relationship between a firm and an outsourcing service provider. This paper analyzes whether and how a modular IT architecture - service-oriented architecture (SOA), in particular - contributes to the potential of BPO by increasing the benefits and reducing the costs. This research question is investigated using a multi-case study approach based on six different firms which have adopted SOA. Three of them have already made BPO experiences based on SOA and all confirm SOA's positive impact on BPO. Besides identifying success factors, counter intuitive results and new research opportunities are identified.

Keywords: Service-oriented architecture (SOA), business process outsourcing (BPO), B2B integration, business value, multiple case studies.

INTRODUCTION

Nowadays, IT and the Internet offer manifold opportunities to engage in outsourcing of business activities which do not belong to a firm's core competencies. This business process outsourcing (BPO) leads to an e-Business partnership between the firm and its BPO service provider since the activities of the two parties need to be integrated electronically in order to make BPO an efficient organizational redesign. Examples for BPO, which have become quite common, are bill presentment and payment, accounts payable and receivable administration, HR administration, and industry-specific activities such as loans proposal assessment and servicing in the financial industry. According to Umar, e-Business deals with "running the entire business through Internet technologies" [27, p. 218] and thereby highlighting the important role which web technologies and the Internet play for e-Business. At the same time, SOA is seen as a possibility to reshape the entire IT landscape of an organization by replacing large monolithic systems with modular services, which can directly be assigned to single business processes and activities in them respectively. Thus, while most e-Business literature focuses on the role of technology for B2B integration (so-called interorganizational systems, IOS), we aim at investigating the firm's *internal* IT architecture's contribution to facilitate BPO in terms of whether

and how the resection of business activities and their transfer to the provider can be supported. In particular, we are interested in service-oriented architecture's (SOA) role for increasing the potential and value of BPO. Our research question is: *How can SOA contribute to the effectiveness of BPO?*

We conducted six case studies, which help to answer this question and to advance existing research investigating especially the intersection of these two phenomena (i.e., BPO and SOA). Moreover, practitioners considering their organization to move more into e-Business, but lack critical competence regarding some business processes necessary for e-Business, will see possible solutions for leveraging BPO in order to successfully engage in e-Business.

The remainder of this paper is structured as follows: First, related research on BPO and SOA is presented. Next, the applied research methodology is described and an overview about the six organizations investigated is offered. Afterwards, the organizations are analyzed with respect to the impact SOA has on BPO potential and effectiveness in each organization. Last, the identified relationships are discussed, limitations and opportunities for further research are highlighted, and conclusions are presented.

RELATED RESEARCH

Business Process Outsourcing (BPO)

BPO is defined as the delegation of a business activity (i.e., an entire business process or just part of it) to an external BPO provider, which includes the necessary resources [11] and thus can also include the supporting IT systems. However, BPO is about delivering a business process result (with or without the IT), such as "accounts receivable processing/administration" but not like IT outsourcing, which just provides the operations of IT systems. Thus, the BPO provider is only responsible for delivering the desired business process outcome and thereby can freely decide *how* the process outcome will be produced (e.g., extent of IT usage, usage of certain systems) [6]. Although many information intensive processes (e.g., procurement, or HR administration, finance & accounting) would be ideal candidates both from a strategic and a cost perspective, the adoption rates of BPO are still quite low in comparison to IT outsourcing (cf. e.g., TPI outsourcing index at www.tpi.net).

Most research on BPO has followed the established IT outsourcing research paths and has investigated inhibitors and drivers of BPO adoption [11, 12], evaluated the business impact of BPO [28], or revealed success factors for BPO [29], e.g., governance and control structures [15, 19], BPO readiness [20], or effective sourcing mechanisms [26].

However, the role of IT for the success of BPO has not been investigated in greater detail, yet, which is interesting as especially standardized interfaces between IS are supposed to ease BPO [7]. Also, empirical results have shown that organizations using more IT also outsource more services [1]. Thus, our research will extend the previous knowledge by investigating the role of SOA for BPO in particular.

Service-Oriented Architectures (SOA)

SOA has become a widely accepted major trend, leading to many different definitions, conceptualizations and hypes around the basic concept. We will draw on one of the well-established definitions, which defines SOA as “framework for integrating business processes and supporting IT infrastructure as secure, standardized components - services - that can be reused and combined to address changing business priorities” [5, p. 5]. Although SOA is often seen as not being new because it mainly leverages already existing principles, the combined use of the service-oriented principles is a promising basis to enhance the BPO activities of organizations. The most important of those principles are: loose coupling, stateliness, abstraction from underlying logic, and the division of reusable logic into services [5, 10, 14].

Moreover, modular services, which are loosely coupled and reflect a decomposable part of a business process, do have exactly such degree of modularity which is necessary for decisions regarding BPO. Also, service orientation offers a basis for the flexibilization of firm borders [22], where services can be used easily regardless whether they are located inside or outside of an organization [16].

Comprehensive studies for investigating SOA are still quite rare [e.g., 3, 17, 18, 22, 25]. As conceptualizing SOA for quantitative research is one of the key problems, qualitative research has been applied more often. However, even case studies have not investigated the role of SOA for BPO, yet, but instead focused mainly on SOA adoption [e.g., 13, 21, 31] or the overall business impact of SOA [e.g., 2, 23]. A first conceptual model investigating SOA's role for BPO is provided by Beimborn et al. [4] to guide this research avenue.

RESEARCH METHOD

Due to the relatively immature body of literature

regarding the intersection of the two phenomena (i.e., BPO and SOA), we applied an exploratory multi-case study approach [8, 24, 30]. In particular, the use of a case study approach will support us in identifying *why* certain organizations outsource business processes supported by SOA as well as in revealing factors for *how* BPO based on SOA can be done (more) successfully. Thus, we can leverage the case studies to explore the investigated phenomena.

In total, we have conducted six case studies with firms operating in the German service industry. While the first four organizations operate in the financial industry, the other two companies work in other service sectors (cf. Table 1).

A semi-structured interview guideline with open-ended questions was used for conducting the interviews. Except in Firm 2, all interviews were tape-recorded and afterwards transcribed. All interviews were done in German by two researchers. This way, one researcher could concentrate on conducting the interview according to the interview guideline, while the other researcher could make notes and ask additional questions. All interviews were encoded using MAQXQDA 10. Additionally, memos were used to structure the information. Further sources of evidence (presentations and documentations provided by the firm) were used to increase the validity of the case study analysis [30].

Firm	Industry	Interviewees
1	Bank	- Head of Architecture
2	Bank	- Head of Enterprise Services
3	Bank	- Head of the IT department responsible for SOA
4	Fund management	- Managing IT director - Two enterprise architects
5	Recycling services	- CIO by deputy
6	Media	- CIO

Table 1. Overview about case studies.

All of the six firms have already implemented SOA. Firms 1, 5, and 6 have adopted SOA broadly across all of their business areas. However, Firm 1 especially highlights that even though different SOA projects are conducted in various business areas, it is not the goal to strategically change the entire IT landscape, but to adopt SOA only where it makes sense from a business perspective. This approach is similar to Firm 2, which moves to SOA whenever applications have to be adapted, but not without an external need to change the functionality. Historically, the SOA approach of Firm 2 as well as of Firm 6 has resulted from previous enterprise application integration (EAI) initiatives and is not triggered from the top, but rather from the bottom. Hence, first applications will be integrated ser-

vice-oriented and then more and more parts of the functionality will be available as services and thus the applications itself are vanishing. In contrast to this, Firm 5 uses SOA as a strategic means to harmonize processes and finally to establish standardized processes. Last, Firms 3 and 4 begun implementing SOA to support the different channels offered to its customers (i.e., branch, mobile sales, call-center and internet). Thus, these two organizations wanted to reduce or even eliminate redundantly implemented functionality at the different channels and to set up a consistent multichannel management.

ANALYSIS: IMPACT OF SOA ON BPO

This section describes each of the six case studies with respect to the investigated relationship between SOA and BPO.

Firm 1 has not gained experience regarding BPO based on SOA. Moreover, the interviewee is critically regarding SOA's impact on BPO:

"I believe that the BPO business will not gain a big boom from SOA."

However, while he basically argues that BPO was already possible before SOA and that SOA will not have a large impact on BPO activities, he acknowledges that SOA facilitates the BPO transition, if a firm has decided to outsource business processes. But according to him, a decision for BPO itself will not be made sooner only because SOA is available:

"I believe that SOA can help us. I believe that this will come for sure later somewhere along the way."

Firm 2 has experienced advantages regarding BPO after implementing SOA. After having adopted SOA, the organization has already outsourced its payments processing activities. According to the interviewee, their business processes could be easier outsourced based on SOA because loose coupling, independence of the used technology as well as standardization of services facilitated the "resection" of the relevant parts of the IT infrastructure during the BPO transition. As a consequence from this positive experience, a further project has been initiated to outsource more activities such as securities processing. Additionally, SOA is used by the bank to link its processes to foreign stock exchanges and clearing houses.

Firm 3 emphasized that their SOA provides BPO opportunities because of its inherent design principles, but that currently outsourcing is not part of its business strategy:

"We would be able to do that [BPO], but at the moment it is not in our focus. According to our business strategy, we think very

carefully whether we should keep the service in-house, or whether we should outsource it. [...] I confirm that a service-oriented architecture would ease this [BPO]. Yes. That is always the case. If I am clearly structured, I will be able to perform those things [BPO] better."

Thus, the bank has decided not to engage in BPO, yet. However, they use their SOA in other B2B arrangements, for example including service intermediaries in the retail banking market. Those sales intermediaries sell products of the focal bank, and vice-versa the bank also sells products of other financial service providers, such as insurance firms. These B2B arrangements are implemented by using the SOA, which reduced the effort for offering a product of another company via different channels (branch, phone, web etc.) without redundantly implementing it. Moreover, the integrated services could easily use services already available in the SOA of the bank, which provide common functionality such as history of contacts, save points for continuing the process, etc.

The fund management organization, Firm 4, has outsourced business processes, such as address validation, to an external BPO-provider. According to them, a key advantage of using SOA for BPO is that the outsourced business processes can be monitored more easily than before when data interfaces instead of process interfaces were used to integrate large systems:

"I think that we can do it more easily because we have represented the process on a certain level using orchestration. For example, the process 'creation of a depot' involves the following systems or provider and I can say which process I have to monitor. [...] I believe that this eases the administration. In the past, when we have integrated five large systems using no process interfaces, but data interfaces and others, it was relatively difficult to establish monitoring on the process layer."

In addition, switching from one provider to another is a lot easier than before, because the large monolithic systems have been replaced by clearly separated services. This has not only reduced the initial efforts for changing providers but also reduces the effort for operating and maintaining the systems, which in turn requires less interfaces and no data replication:

"Our job is only to say to the new provider, who implements this new workflow system: 'This is how the services look like, that is the interface of the service, that is how the fault handling looks like. Do it.' And we can lean back and support them during the integration, i.e., testing, but we do not have

an active part anymore. [...] Instead, when I think about how it was before, when we integrated every system separately and additional interfaces had to be build, data to be replicated, operations were very expensive."

Additionally, Firm 4 highlights the eliminated need for service redundancy. Using SOA for integrating services from external providers into own processes has the great advantage that once integrated it is readily available for the entire organization without the need to create further interfaces.

"We have integrated the functionality of an external provider (a geo-localization service), which we have made available for the entire organization by making the functionality available as internal service."

Firm 5 (recycling services) agrees that SOA and its inherent design principles help to outsource business processes:

"According to the basic principles, of course. I can confirm this to 100%. In particular, SOA concepts are able to ease the standardization and logging of interfaces. Both are very important tasks."

However, this firm is still in the beginning of adopting SOA and thus is not ready for BPO based on SOA yet. However, outsourcing of non-core activities is seen as a future move of the entire service industry and perceived to be only a matter of time:

"We have not made enough progress in order to outsource business processes, yet. However, this is an absolutely interesting opportunity in certain areas, if you consider that we print many thousands of invoices, which we would then no longer need to envelop, stamp, etc. by ourselves. If such processes are reasonably stable, one could outsource them and this is definitely a topic, which will massively appear in the service industry."

Moreover, Firm 5 already used SOA to enhance B2B integration outside the BPO paradigm. Based on SOA, three different channels are offered to business partners for exchanging business documents (e.g., delivery notes or weight notes), which are directly validated, and business partners get an immediate reply confirming the validity of the transmitted documents for the particular business process.

In contrast to the five previous organizations, Firm 6 has a different view on SOA's role in the BPO context. The media company has a long history regarding BPO as large parts of its operating business had been outsourced in the past. For example, call-center operations, pre-pro-

duction, broadcasting, and the production of the own newspaper are outsourced to separate providers. The CIO stated that BPO decisions were made quickly without considering the IT or planning for preparing the IT. Instead, he as the CIO has to prepare the IT for future BPO arrangements. Thus, the primary benefit of SOA is that it helps him to modularize the IT to a degree which allows him to efficiently support BPO decisions.

"My IT has to be modular to a degree that when business processes are outsourced an efficient IT is able to stick everything together. It is not our explicit goal to first modularize the IT in order to outsource in a second step. But, if outsourcing is ordained by God [i.e., by the business side], we will have to be ready for that. [...] At that time, it has to be done and the more efficiently I have prepared for that, the fewer problems I will have that something is not working."

DISCUSSION

After describing the single cases, they will now be jointly examined in a cross-case analysis. Three of the six cases showed experience with BPO based on SOA (i.e., Firms 2, 4 and 6).

All of the six investigated organizations have confirmed, that SOA and its inherent design principles, such as loose coupling, independence of technology, standardization of services, facilitate BPO.

Although agreeing that SOA eases BPO, the interviewee of Firm 1 also doubts that SOA will increase the BPO activities of the organizations. Thus, he claims that the decision regarding outsourcing business processes is more or less unaffected by the availability of SOA. Consequently, even though an organization might have a higher BPO readiness due to adopting SOA, this will only be a minor benefit and thus no decision-relevant factor.

Firm 3 is an example for an organization which perceives substantial potential of SOA for BPO, but has no experience regarding BPO as outsourcing is not in line with its business strategy.

Firm 4 has added another benefit when BPO happens based on SOA. It emphasized that the effort for switching from one BPO provider to another is reduced a lot. Thus, SOA not only facilitates BPO at the beginning, but also when an existing BPO arrangement is changed.

Interesting is also a comparison of the statements of Firms 5 and 6. The former sees BPO on the basis of SOA as a definite topic, which needs to be debated, but first of all the business processes need to become mature enough for utilizing SOA in an effective way. However, BPO is seen as an important move for the entire service industry. Firm 6, on the other hand, does not agree to this

evolutionary approach that the IT has to be modularized first before one can think about outsourcing of particular processes. While Firm 5 takes the time for setting up a modular IT architecture and does not think about BPO before the IT is ready, Firm 6 sees SOA as a means to be flexible enough to fulfill any possible business needs. Thus, SOA helps the CIO to have the IT ready, when the business decides to outsource business processes. In this case, the business does not take IT readiness for BPO into account. This makes SOA an effective means to cope with increasing sourcing flexibility demands requested from the business side.

Besides these similarities and differences regarding the interplay between SOA and BPO, in terms of whether and why SOA facilitates BPO, as it is perceived by the deciders and IT architects, we uncovered three success factors for BPO based on SOA from our cases:

(1) Persuade business units to think service-oriented: Firm 2 states that a barrier for further outsourcing activities is a lack of service-oriented thinking and an understanding of interfaces in the business units. Both are necessary to modularize the existing functionality in order to be prepared for BPO. However, at the moment it is difficult to define the interfaces and necessary data to be transferred without such an understanding on the business side.

(2) Establish end-to-end process monitoring: Firms 2 and 4 reported the critical importance of having a comprehensive end-to-end process monitoring system in place to monitor the BPO provider's activities. Firm 2 highlights its capabilities to monitor the service levels as important success factor for its outsourcing success and adds that it is necessary to monitor the entire process. The main reason for this is that SLAs can only be effectively controlled on the process level. Due to SOA, a business process is supported by relatively more services compared to a single (or few) system(s) before SOA was adopted. From a business perspective, the availability of single systems or services is less meaningful than the availability of the overall business process, which depends on the services. This is because the consequences on the process level are the eventually relevant outcome which is relevant to the business, but not the causes resulting from failure of single services. Firm 4 adds that it is important to monitor the entire business process, which is not only important for the outsourced part, but also for the remaining part still operated by the firm itself.

"We have to know whether the process operates, and if the process is not working, we need to know where it does not operate."

"And for this we need a different monitoring. We already have this in some areas."

(3) Analyze the business processes: While in general the different interviews provide evidence that SOA helps to outsource business processes, Firm 1, adds another important success factor for BPO. Analyzing the business processes carefully, regardless of having an SOA implemented or not, can already help to separate the value chain into parts which could be outsourced (e.g., non-core activities) versus parts which should not be outsourced (e.g., core activities or according to business strategy). Afterwards, when decisions for or against outsourcing of particular activities are made, SOA facilitates BPO because it does not only provide a technically modular infrastructure, but also gives a module blueprint which clearly shows which services match to those activities and thus can and should be outsourced.

LIMITATIONS

The most obvious limitation of the results is that they are based on only six case studies and that BPO based on SOA is still a quite young phenomenon. We will proceed in collecting new cases (in the same and other industries and maybe even in other countries) and re-observing the cases analyzed above in order to raise our understanding about under which circumstances SOA actually facilitates BPO and whether it also might create obstacles if not properly designed. However, as no previous empirical study investigating these phenomena has appeared, yet, the identified aspects can serve as a basis for other researchers, as well, in order to conduct similar studies.

Another limitation is that we interviewed only managers on the IT side, which are very deep into the IT architecture topic but often are less knowledgeable about the firm's business processes and sourcing strategies. However, talking to people from the business side would lead to the challenge talking about SOA; in this case it would be very difficult or even impossible to gain valid results because these people usually cannot link the SOA design principles and the actual implementation of their processes within the IT infrastructure to the (mainly technically driven) advantages for BPO.

IMPLICATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

We have observed that BPO based on SOA already shows some adoption (3 out of 6 firms). This "adoption rate" of 50% is rather high. We have investigated other companies in a broader context by using a survey among firms operating in the German service industry. The following figure shows that, according to different business areas, only 16 to 27% of the 127 responding firms

already have experience with BPO based on SOA. Overall, 36% of the firms have experience with BPO based on SOA in at least one of the five business areas.

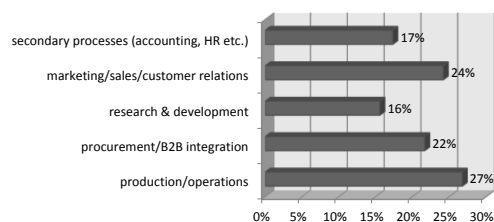


Figure 1. BPO based on SOA

Generally spoken, if outsourcing is an option from a strategy perspective, firms find SOA valuable in increasing the benefits of BPO and facilitating the implementation of the outsourcing arrangement (transition, implementation of process interfaces etc.). Moreover, SOA is not only perceived to be positive for the initial transition of a business process or parts of it to a BPO provider, it is also beneficial for later changes to existing BPO agreements (e.g., switching BPO providers), which might decrease the strategic threat of becoming too dependent on a particular outsourcing provider (i.e., facing a provider lock-in [9]). However, at least one interviewee indicated that the availability of an SOA will not have an impact on the BPO decision itself. Thus, the technical BPO readiness, which is increased by SOA, is not part of the BPO decision determinants, thus either playing only a minor role in terms of BPO benefits and costs or being not apparent enough in the deciders' mind (too low mindfulness) to be considered.

The case analysis uncovered three success factors for BPO based on SOA (i.e., service-oriented thinking of business units, end-to-end process monitoring, and business process analysis).

The debate whether SOA and the business processes have to be ready enough (cf. Firm 5) before BPO or whether the IT has to be ready when the BPO decision is made (cf. Firm 6) represents an interesting research question, but remains open to further research.

While we have only investigated SOA's impact on BPO, the opposite view should also be captured by future research. It could also be that due to SOA more firms will act as insourcers offering their core activities (in terms of core competencies) to other firms as SOA does not only facilitate outsourcing but also insourcing in terms of acting as a provider and taking over activities from other (outsourcing) firms.

Our paper has made a first step to bring two important concepts together: BPO and SOA. Thereby, these are the first results from investigating this phenomenon applying a multi-case study approach. The positive relationship between SOA and BPO, meaning that SOA indeed

facilitates BPO, feeds back to general research regarding the business value of SOA. As BPO represents one of many benefit aspects of SOA, it should be considered and evaluated by a firm evaluating a possible SOA introduction. Inversely, SOA is an potentially important IT-related success factor for BPO; thus, SOA arguments also inform the broad field of research on outsourcing success determinants.

Concluding, the following picture structures the results from our exploratory study and thus offers different avenues for further research.

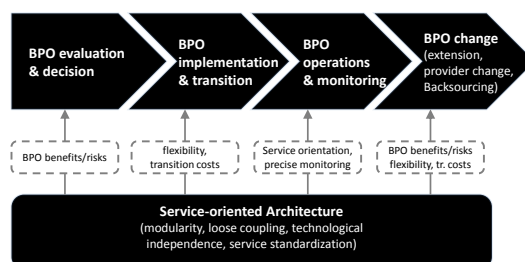


Figure 2. Interplay between SOA and BPO

The cases showed that SOA is related with several steps of the BPO “lifecycle”. In some cases, SOA was already considered as a determinant relevant for the BPO *decision*. Future research will have to uncover which BPO-specific benefits and risks (i.e., BPO decision factors) will be affected to which degree by SOA. Beimborn et al. [4] provide a first conceptual model of decision determinants to guide this research avenue.

Other cases highlighted that SOA's contribution is not strong enough to play a significant role in the BPO decision, but that it will definitely be a facilitating force in the *implementation* of the BPO arrangement (i.e., resecting the activity from the firm's architecture, transferring it to the provider, and implementing the service interfaces for enabling straight-through processing). Here, the research question will be how SOA (and which design of SOA) will provide the necessary flexibility and thus will lead to a decrease of transition costs.

Third, the interviewees highlighted that SOA-based BPO will be more transparent during *operations* and that, e.g., failures can be more easily and precisely monitored and rooted to its originator. Service orientation on business process level and technical level – which are matched to each other – allows for more precise monitoring.

Finally, we found that SOA will increase flexibility when it comes to *change* the BPO arrangement, either by extending it, by switching to another provider, or by sourcing the activities back to in-house. This reduced strategic problem of lock-in will already be resembled in the BPO risk evaluation which might affect both the initial outsourcing decision but also follow-up decisions. Research will have to clarify whether SOA actually reduces lock-in risks and follow-up transition

costs when switching the provider or whether process interfaces cannot be standardized to a degree which fully leverages these potentials of SOA.

Concluding, our initial work on the interplay between SOA and BPO uncovered some interesting results and gave first evidence for SOA's positive impact on BPO. We encourage other scholars to jump on the train in order to make the full e-business potential of SOA visible and tangible.

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MAKING SENSE OF SOFTWARE ECOSYSTEMS: A CRITICAL REVIEW

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ABSTRACT

Visualizing software as ecosystems has been an emergent phenomenon. The objective of this paper is to analyze the field of software ecosystems (SECO) and provide a critical review of the existing literature. This research identifies domains and peripheries of a SECO; highlights architectural challenges; examines design and control mechanisms and discusses some of the learning's from other popular paradigms that can be applied to address the key challenges in the SECO paradigm. This paper also aims to recommend future research directions for software ecosystems and its role in the broader context of information systems research.

Keywords: Software Ecosystems, Digital Ecosystems, Complexity, Information System Theory, Commons Based Peer Production, Open Source, Open Innovation

1. INTRODUCTION

Charles Darwin describes in his seminal work, *Of the Origin of Species* [1], that it is not the strongest of species that survive, nor the most intelligent, but the ones most adaptable to change. Similar to natural ecosystems that are complex and continuously evolving, the construction and management of software has become ever more complex and subject to continuous change. The survival of software systems is contingent to Lehman's software evolution law [2], which stipulates that a program must be continually adapted else it becomes progressively less satisfactory over time.

Complexity in the development and maintenance of software in terms of lines of code, functionality and interactions with other systems has continuously increased over the decades. As described by Bosch [3], the introduction of software product line approach and software engineering methodologies in the development of software has helped in dealing with this complexity and in streamlining the production of software. In today's rapidly evolving market place, companies have taken their product line architectures and components and made them available to parties external to the company.

Bosch suggests that once a company decides to make its platform available to entities outside the organizational boundary, the company transitions to a software ecosystem. Companies in asymmetric competition in the market place use software ecosystems as a strategic tool to compete. An example of this fact is the asymmetric competition between Firefox and Internet explorer; although Mozilla foundation, which manages Firefox has lesser organizational resources compared to Microsoft, it has been able to successfully compete against a large well-established player [8].

True to Lehman's software evolution law, Firefox was able to adapt to the long tail needs of its customers by creating an open platform and providing developer friendly tools through which application developers created a plethora of Firefox apps and customizations.

This adaptation of Firefox to a changing industry environment enabled the survival and growth of both the ecosystem around Firefox and the browser. The fall of Nokia's Symbian and the recent success of the Apple iOS and Google Android have further fueled the need for the study of the ecosystem approach towards building successful software products [28].

Toffler describes consumers as a phenomenon of the industrial age and proclaims a shift to the Prosumer Age in which people produce many of their own goods and services [6]. Hippel conforms to Toffler's ideas of innovating in the Prosumer age and suggests that involving lead users of a product in the innovation process greatly enhances the attractiveness of the innovation [5][29].

Chesbrough describes that a firm can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology [4]. One of the key roles of software ecosystems in the Prosumer age is to facilitate innovation and collaboration between producers and consumers of digital good and service [3].

Section 2 of this research identifies the domains and peripheries of a software ecosystem. Section 3 examines design and control challenges for companies and product developers in a SECO environment.

Section 4 compares SECO with other popular paradigms and looks at building upon existing theories to address challenges in a SECO. Section 5 summarizes the findings and provides future directions for the field of SECO. The contribution of this research is a critical review of the emerging literature around software ecosystems and suggestions of future research directions for this new paradigm.

2. Domains and peripheries

Researchers have taken different approaches towards describing the role of software ecosystems. The difference in perception of ecosystem peripheries and domains is primarily dictated by the author's object of study, which the author uses as a point of reference to view the ecosystem. From the existing literature, three main points of reference have been identified namely software ecosystems as organizational interactions, software ecosystems as a new layer of abstraction in technology platform construction and software ecosystems as strategic business and economic systems for growth in the market place.

2.1 Software ecosystems as organizational interactions

Bosch focuses on the organizational challenges that are addressed by software ecosystems and examines the inter-organizational interactions of a software ecosystem. Bosch suggests various benefit that this approach provides, which are increased attractiveness for new users, increased "stickiness" of the application platform, accelerated innovation through open innovation in the ecosystem and decreased TCO for creating new functionality by sharing the cost of maintenance with ecosystem partners [1]. Bosch further provides taxonomy to visualize the peripheries of ecosystems based on categories and platforms. Categories describe the methods of engaging with the ecosystem, which can be applications, operating systems or languages. The platform describes the interfaces, which can be based on web, desktop or mobile technologies.

Software ecosystems are modeled as multilevel interactions between organizations by Janesen et al [7]. The software ecosystem level encompasses the vendor level and the software supply network level. The software vendor level represents the organization that designs, builds, and releases software functionality within the SECO, the software supply network level

represents buyers and suppliers who interact with the software vendor. The actors at various levels in the SECO function as a unit and interact with a shared market for software and services. Janesen further describes that the relationship between the actors at various levels in the ecosystem is based on a common technology platform or market space and the interactions are based on the exchange of information, resources and artifacts [9].

Messerschmitt et al identify software ecosystems as a group of businesses units working together and interacting with a shared market for software and services, these business units develop relationships among them. These relationships are formed due to the entities interest in the co-evolution of a common technological platform [27].

McGregor defines the ecosystem for a software product line as all the entities that interact with the product line organization. Information, artifacts, customers, money and products move among these entities as part of the planning, development, and deployment processes [11]. The product line ecosystem is a subset of the IT ecosystem, which is the large network of firms that drive the delivery of information technology products and services.

The view of software ecosystems as organizational interactions proposed by Bosch, Janesen, Messerschmitt and McGregor highlights the various tensions that arise from these interactions and describe the need for further study of these tensions.

2.2 Software ecosystems as a new layer of abstraction in the construction of technology platforms

Lungu et al describe software ecosystems as a collection of software projects; these projects are developed together and co-evolve in the same environment [12]. The environments in which software ecosystems evolve are classified into physical and virtual. Physical ecosystems represent the boundaries of the firm and the virtual ecosystems are the online communities of end users and developers.

Petra et al describe software ecosystems as a composition of a software platform, a set of internal and external developers, a community of domain experts and a community of users that compose relevant technical solution elements to satisfy their needs [13].

Akin to Petra et al, Goeminne et al describe the ecosystem as the source code combined with the user and developer communities that surround the software and highlight the need for the study of various technical components and interactions to understand how software evolves over time in the ecosystem [32].

Dhungana et al compare ecosystem processes in nature to the technical construction of software ecosystems. Learning's from evolution and bio diversity in nature demonstrate that the way to ensure development and sustenance of a software product ecosystem is to support a wide range of programming languages, platforms, hardware devices and a broad user community across domains and user groups [14].

Akin to Dhungana et al, Briscoe et al describe ways to learn from the self-organizing properties of nature for the construction of software ecosystems. The learning's from biological ecosystems found in nature can be translated to build robust, scalable digital architectures, which can adapt to deal with complex, dynamic problems [33]. Briscoe et al further state that technologies such as Multi-Agent Systems (MASs), Service-Oriented Architectures (SOAs), and distributed evolutionary computing (DEC) can provide the foundation for assimilating the properties found in nature to construct complex digital ecosystems.

The technological view of software ecosystems highlighted by Lungu, Petra, Goeminne, Dhungana and Briscoe can assist stakeholders by improving re-usability, enhancing change management processes in software projects and in the evolution of better architecture for constructing complex ultra large-scale systems.

2.3 Software ecosystems as strategic business and economic systems for growth in the market place.

Levien describes an ecosystem in terms of value creation and identifies a business ecosystem as a subset of a software ecosystem [15]. Various roles in a business ecosystem exist namely keystones, dominators and niche players. A keystone creates and shares value with the rest of the ecosystem; a dominator seeks to extract as much value from the ecosystem, consequently destroying it. Niche players act to develop or enhance specialized capabilities that differentiate it from other firms in the network, leveraging resources from the network while occupying only a narrow part of the network itself.

Hence software ecosystems as a strategic tool should address the needs of various stakeholders in the ecosystem for its long-term sustenance. Iyer highlights the role of ecosystems in strategy formulation in organizations and describes two main roles of a keystone strategy; the first is to create value within the ecosystem and the second is to share the value with other participants in the ecosystem. Unless a keystone finds a way of doing this efficiently, it will fail to attract or retain members [16]. Hannesen identifies one of the strategic objectives for an organization developing an ecosystem as that of encouraging its customers to participate actively in the ecosystem [17]. The key driver for customers of a product line to participate in the evolution of a project is the ability to affect the development in ways that would benefit that customer. Hannesen further describes that this type of collaboration evolves into a self-regulating system where the product line developer (keystone) and the end customer who is actively engaged in the ecosystem mutually adapt to each other's strategic needs thereby leading to a win-win scenario.

Van den Berk et al describe the role of ecosystems in vision formulation and overall strategy of an organization through an ecosystem strategy assessment model [18]. Software ecosystems as a tool for vision and strategy building enables niche players to plan and orchestrate a future state of the software ecosystem. Van den Berk et al describe that a well-defined software ecosystem vision motivates partners to join the ecosystem and increases the opportunities for success for all the stakeholders involved in that ecosystem.

The business view of ecosystems as described by Levien, Iyer, Hannesen and Van den Berk demonstrate the strategic advantages of using ecosystems as a tool to compete in the market place and its role in facilitating development of new competencies through leveraging the resource of ecosystem partners.

3. Design and Control

Control in the development of software in a non-ecosystem context is left to the entities within the organization. In the software ecosystem context the product line transforms into a platform for developers external to the boundaries of the organization. This metamorphosis from product lines to ecosystems causes various challenges in the design and ways of controlling the evolution of the end product.

Bosch describes various architectural challenges in using a software ecosystem approach in the construction of products [19]. The keystone or the product controller should provide a stable interface between the platform and the external developers for collaboration and smoother integration of the product, security and control mechanisms should be used in the architecture to reduce the chances of a hostile entity introducing defective or malicious external code.

Hence the architecture needs to be designed for changes and future changes should be announced before the release for all actors in the ecosystem to co-ordinate.

One of the key problems when it comes to developing in an ecosystem is managing dependencies between various projects and developer groups. Dependencies can be managed by mapping the usage of various components and the impact of the changes to the components on the overall ecosystem. Hence understanding dependencies between the entities of a system is crucial in the design of scalable robust systems and Lungu et al describes that understanding these complex interdependencies between projects in an ecosystem is possible through documenting the overall ecosystem structure and more importantly making this knowledge available to the various developers of the ecosystem [20]. Monitoring the usage of various frameworks and the evolution of API's through which the components interact with the ecosystem reduces the chance of errors during integration. Charting frameworks that various projects use between each other enhances reuse of components and resources between projects. Thus improving the overall reliability and efficiency of the ecosystem.

The control of software ecosystems and their revenue models are determined through licensing of products and components that are part of the ecosystem. Software ecosystems are often made up of heterogeneously licensed products and components. These software licenses both facilitate and constrain the evolution of the ecosystem depending on their design. Hence the charting of licenses of various components is crucial in assisting the co evolution of various components and their interdependence [21].

Herold et al describe that due to complexity, life-cycle, and globalization issues that are predominant in ultra large scale projects such as software ecosystems, classical engineering

approaches are no longer applicable. Software ecosystems cannot be planned, designed and implemented as a whole. To deal with these new challenges that are put forth by the emerging field of software ecosystems new software system engineering approaches are required [31].

The study of these new engineering approaches could form the future research agenda for the field of software ecosystems.

4. Building upon existing paradigms

Some of the key challenges in the emerging paradigm of software ecosystems are similar to the existing problems in the field of organizational design, architecture and the governance of digital commons, which have been addressed through existing fields of research such as complex adaptive systems, information infrastructures, commons based peer production and innovation studies.

The issues in the realm of Information Infrastructures & Complex Adaptive Systems revolve around the tensions between control and generativity in the design and architecture of systems. The drivers of generativity, which are change and control, are relevant to the emerging field of software ecosystems. Hanseth et al highlight the various challenges in designing and architecting digital infrastructures among which the bootstrap problem and the adaptability problem are highly relevant to software ecosystems.

The bootstrap problem deals with early users' needs in order to be initiated to participate in the system and influence its evolution; and the adaptability problem deals with the need for local designs to recognize information infrastructures unbounded scale and functional uncertainty [22], the challenges highlighted by Hanseth et al apply to software ecosystems and can be extended to solve similar challenges in the ecosystem context.

Tilson et al describe the paradoxical nature of digital infrastructures and debates the arbitrages between designing for stability versus flexibility and centralized versus decentralized control [23].

Tilson, Sorensen & Lyttne further state the need to study the ways in which infrastructural change shapes IT governance, IS development, and promotes new effects across all levels of analysis, which are relevant to the study of emerging field of software ecosystems.

The recent discussions in the field of Commons Based Peer Production revolve around licensing, control points and the governance of communities. Hippel describes that the greater the involvement of the lead users of a product, greater is the resulting innovation [18]; hence the involvement of the end users and developer communities of a product holds the key to its innovativeness.

But as described by Chengalur-Smith et al, the attractiveness of an open source project is related to its governance structures. Licenses are a way to enforce the rights to use, copy and modify; the design of governance structures enables the right to gain visibility, to influence and to create derivatives of a project, whether in the form of spin-offs, applications or devices. More importantly, the governance model describes the control points used in governing platform boundaries and is a key determinant in the success or failure of an open platform [24].

The study of governance structures and incentives and their role in attracting platform developers, end users and application developers to various software ecosystems is a topic that applies to the emerging field of software ecosystems [30]. In the field of Innovation studies, the topics that can be applied to the study of software ecosystems are the subset of open innovation (Chesbrough 2003), user driven innovation (Hippel 2005) and digital innovation (Henfridsson 2009) [25]. One of the key debates within the field of innovation studies is the tension between exploration and exploitation (March 1991) and how companies manage this tension [26].

Firms can implement the process of exploration through open innovation, where firms establish ties with other organizations to share each other's knowledge and mutually benefit from the resulting innovation. But as companies venture out to partner with external vendors, end users and developer communities by opening up their platform through controlled modularity: various tensions are brought about in the management of the innovation network and in the sharing of the created value [30].

Existing research on how firms that provide product platform control them and how these controls evolve over time is limited, Henfridsson et al describe the need for a study of platforms that are based on the layered modular architecture. Software ecosystems are designed on a layered modular architecture and hence the

issues mentioned by Henfridsson et al are relevant to the study of software ecosystems. Some of the existing research on organizational interactions and control points in open innovation networks can be applied to the field of software ecosystems to address some of the key challenges of organizational design and governance of stakeholder interactions in software ecosystems.

5. Conclusions & Future directions

This research has identified some of the emerging debates in the field of software ecosystems. Although different authors perceive software ecosystems as belonging to various domains and having different peripheries, a key pattern is observable across literature.

Most of the authors concur the role of a software ecosystem as an architectural tool to manage complexity or as a strategic tool to maximize value by leveraging resources external to the boundaries of the firm.

Software ecosystems provide a means to learn from processes in nature by assimilating them in the construction of software and in the design of organizations [14]. The key strength of software ecosystems, which is participation of external actors and open component interactions, is also its key challenge unless appropriate design and control mechanisms are formulated.

As ecosystems are comprised of various projects and complex loosely defined components that interact with each other; too much control in an ecosystem leads to users moving to other ecosystems and too little control would lead to bugs or other inefficiencies in the end product, hence an optimal control mechanism that promotes developers to partake in a SECO activity is crucial to its success.

The study of control mechanisms in complex socio-technical settings warrants detailed investigation and could play a key role in the future research agenda in the field of software ecosystems.

As described by researchers, the field of software ecosystems compliments the existing body of literature on the study of socio-technical interactions.

This new paradigm brings about some key challenges in the form of organizational, technical and social tensions.

Some of these tensions are addressed by existing information systems theories such as complex adaptive systems, digital innovation and commons based peer production, which can act as a theoretical lens for understanding these tensions.

But new theories need to be evolved to address some of the challenges that are unique to the paradigm of software ecosystems. The study of these tensions and formation of new theories to address emerging challenges in the ecosystem context could form the future research agenda of the field of software ecosystems.

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An Intelligent Online Shopping Guide Based on Product Review Mining

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ABSTRACT

This position paper describes an on-going work on a novel recommendation framework for assisting online shoppers in choosing the most desired products, in accordance with requirements input in natural language. Existing feature-based Shopping Guidance Systems fail when the customer lacks domain expertise. This framework enables the customer to use natural language in the query text to retrieve preferred products interactively. In addition, it is intelligent enough to allow a customer to use objective and subjective terms when querying, or even the purpose of purchase, to screen out the expected products.

Keywords: Intelligent Shopping Guidance; Natural Language Processing; Case-based Reasoning; Ontology; Naïve Bayesian

INTRODUCTION

Background and Motivation

Sophie wants to buy a new digital camera from Amazon for her graduation trip to Paris: a portable, inexpensive camera able to shoot nice photos in museums where she is going to spend a lot of time. However, since Sophie is a pure outsider to digital photography and electronic products, she Googles key words “digital camera for museum” and browses the results. The first hit is a list of cameras by a particular brand, followed by a number of webpages offering tips for taking photos in museums with terms that are Greek to her. Then she visits a professional digital camera review website (dpreview.com). It provides a wonderful tool named “buying guide” which helps users filter out the most wanted camera from the camera database. However, Sophie is totally lost when she is asked to choose features like zoom range, ISO range, prime lens, sensor size, and exposure bracketing, etc. After 1 hour’s frustrating searching and browsing, she gives up and drives out to the Bestbuy store, hoping she can get some advice from the shop assistant.

Sophie’s experience is typical in the context of online purchasing. Actually, only a small proportion of online shoppers can be termed as “prosumers” with adequate domain knowledge who are able to locate the most wanted product by using search engines, browsing professional online discussion board and studying products’ features [1, 2] such as ISO range or constant aperture. In contrast, there is a large number of consumers who can do nothing but just describe the desired *functions* or *requirements* of the product (e.g., low noise and macro photo, etc.). Moreover, the least professional users are perhaps only able to describe their *goals* of purchasing (e.g., taking picture of pet or flowers, “when skin diving” or in museums, etc.). As evident from Sophie’s story, conventional purchasing guide systems such as the one Sophie tried cannot provide adequate guidance to

non-prosumers to find the target product effectively and efficiently.

Another category of intelligent software, called Recommender Systems (RS), also strives to recommend the most needed product to the users [3]. Collaborative filtering approach and content-based approach are two most widely used recommendation methods, and the former has been reported to be highly effective and efficient for intelligent recommendation making [3, 4]. Conventional CF is based on assumption that either the user has prior knowledge and/or interest in items similar to the target product (item-based approach), or like-minded users have rated the targeted product (user-based approach). Conventional CF, therefore, may fail when these assumptions are not satisfied [5, 6]. Indeed, when people want to purchase something they know little about (e.g., a digital camera), they most likely seek suggestions from someone with domain expertise [7, 8]. More and more people are choosing to read product reviews on the internet, online discussion boards, or e-commerce websites. Empirical evidence has shown that consumers tend to believe opinions in online review articles more than commercial advertisements [9]. In this regard, some researchers have recently applied opinion mining to construct knowledge base of products, in an attempt to suggest the right product to customers using various recommendation methods [2, 10, 11].

Automatic recommendation mechanisms based on opinion-mining techniques constitute a plausible way of providing intelligent shopping guidance. The underlying assumption of this approach, however, is that the customer has the ability to specify features of the product sought to be purchased, which is an obvious obstacle when the customer’s expertise is insufficient. A typical query that a user could state is, for example, “an 8 mega pixels’ digit camera with very long battery life, for taking photo in museum.” First, we notice that “8 mega pixels” is associated with the value of the sensor feature of a digital camera, where the association can be derived from the specifications record in the product database. Second, “very long (battery life)” is a descriptive expression of battery life because the user is unable to express the specific measure of battery sustainability, such as “mAh”. Third, since the customer has no idea about what kind of camera is suitable for the purpose “for taking photo in museum”, this purpose of purchasing may be directly specified in the query. This example reveals the inability of conventional feature-based recommendation approaches to serve shoppers with low domain expertise.

In this paper, we propose a framework for assisting shoppers in choosing the most favorable products, without requiring them to have much domain knowledge. Especially, users are allowed to describe their requirements or objectives of purchasing in natural language. The coded requirements are then delivered to the inference engine for discovering the most matched products. The challenges of this research are that 1) how can the requirements be coded and understood by

the system, given that the level of expertise of customers in the product domain varies; 2) how can the knowledge base of the target product be constructed with as little human effort as possible; and 3) how do we design the matching or recommendation algorithm that identifies products most pertinent to the customer's needs.

The Overall Framework and Contributions

In this study, we propose a generic framework to analyze product reviews and provide recommendations for shoppers, as illustrated in Figure 1. The framework consists of two major phases, product Knowledge Base (KB) Construction and Matching. In the first phase, review texts are processed in order to extract features and opinions, using the Natural Language Processing (NLP) module. In this process, the product database and ontologies defined on the domain are needed for retrieving structured product information and understanding the semantics in the review texts. The output of this phase is the product knowledge base for supporting future recommendations. In the second phase, when a customer's query is received, the NLP Module analyzes and encodes the query text and then compares it with products saved in the product KB by the Matching Engine. The output of this phase is the best fit products for the customer's reference.

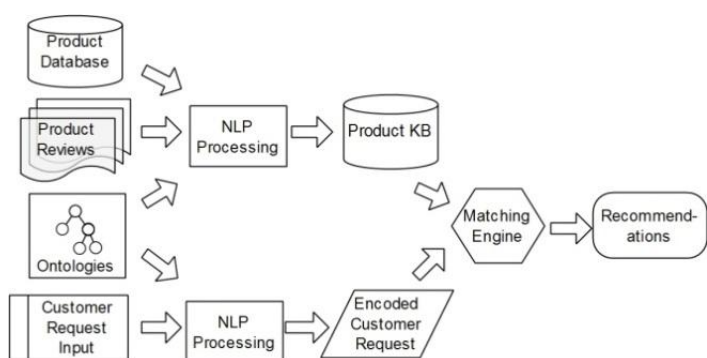


Figure 1. The Overall Framework

In sum, the main contributions of this paper include: 1) Presenting a case-based product recommendation framework with detailed procedures to assist online shoppers; 2) Differentiating and proposing three types of requests in user query text; and 3) Proposing various distance measures to be used for estimating the similarity between the query and the products. This framework can be applied to assist shoppers in discovering their desired products, and hereafter in this paper, we use the e-shopping guidance as a work-through example to demonstrate the efficacy of the proposed methods. This framework, however, is generalizable to many other applications where items are to be recommended to users who are unable to describe their requirements precisely.

The remainder of the paper is structured as follows. In Section 2, a brief review of relevant literature is provided. In Section 3, three types of user requests are explicitly differentiated and the NLP module to process query text and review corpus is introduced. The construction of the ontologies is also discussed in this section. In Section 4, the matching engine is elaborated, with the formulation of distance measures. Section 5 describes the matching

algorithm. The case-based recommendation process is presented in Section 6. Section 7 summarizes the paper and outlines future research directions.

BACKGROUND AND LITERATURE

Recently, systems to suggest the right products to the customer, normally called Recommender Systems or Recommendation Systems (RS), have drawn much attention from scholars. Recommender Systems are defined as intelligent programs which strive to identify products of the most interest to the users, given their historical interests or actions [3]. A recommender system attempts to predict the 'rating' that a user might assign a product by examining some specific characteristics in its profile. These characteristics can be related to the product and the user (the Content-based approach), the user's social environment (the Collaborative Filtering approach) or both (the hybrid approaches) [3]. A user's profile is normally generated by analyzing previous rating information which could be either explicit or implicit [4]. Recommendation systems, especially, have been extensively utilized in e-commerce domains for shopping aid and product recommendation [4, 12]. Specifically, in-depth research on Collaborative Filtering (CF) has been conducted by researchers. CF does not need explicit description of content generally required in the content-based approach for calculation of the similarity between an item and a user's interests. Instead, CF provides recommendations according to user preferences by maintaining users' purchasing record for identifying users with similar tastes. Thus products liked by a user can be introduced to other people of the same kind. However, CF-based systems are known to suffer cold-start problem (new user) and sparsity [3, 5].

It has been recognized that lately, the review or discussion of products on online forums and e-commerce websites has become an important source of information about opinions about a product [13-15]. There is evidence showing that opinions contained in online reviews may significantly affect customers' purchase decisions [9], which can be exploited by intelligent systems to provide better recommendations. In many e-commerce websites or product review discussion boards, explicit ranking scores of different products are available with the review text, normally on 5-point Likert scale. However, making recommendation simply based on the ranking may be problematic since readers' personal tastes may differ from those of the reviewers [16]. For example, a user may be fond of an ultra-compact digit camera regardless of the photo quality, while the reviewers may place more weight on the latter. As such, the reader will have to go through a large amount of review articles, try to digest many unfamiliar terminologies, compare many choices, and make the final decision on its own. Consequently, data mining and machine learning techniques, coupled with natural language processing approaches for extracting product ranking and other valuable information from product review texts have come to be referred to as Opinion Mining [17, 18]. For example, in [11], an intelligent recommendation approach is proposed, which is based on scores discovered from online reviews.

To have recommender systems with a deeper

understanding of customer reviews, researchers apply feature extraction techniques in order to automatically identify the keywords of features or opinions. A number of well-established approaches in NLP can be utilized for this purpose. For example, part-of-speech (POS) tagging tools [19], which can be used to identify POS of words (e.g., adjective or adverb, etc.) in the review text. Some studies consider both product features and subjective terms when comparing products. Notably, Red Opal [2], a recommender system based on opinion mining, explores online customer reviews in order to identify product features and automatically score products according to their features. Hence the most suitable product can be recommended by matching products and features specified by the customer. Opinion mining techniques are also utilized for automatic differentiation of sentimental orientation (recommended or not) towards an item expressed in the text [20], which is especially useful in supporting intelligent recommendation. Notice that dealing with low-quality review corpus is out of the scope of this paper; we assume that all review documents are high-quality (i.e. without noisy data or spam reviews). Readers interested in detection of noisy or spoof reviews may refer to [21-24].

PROCESSING PRODUCT REVIEW AND QUERY

In the overall framework, either the processing of product information to establish the product KB in the first phase or the processing and encoding of the customer query text in the second phase are essentially based on NLP techniques. Hence these two tasks are introduced together in this section.

The goal of guiding a customer to find the favorable product can be achieved by matching the query text with information of products stored in the product knowledge base. In this research, a customer's requirements defined in terms of the product's features, performance parameter and usage context, etc., are referred to as a *request*. In order to understand the customer's query without requiring precise specifications of product features, we explicitly differentiate three types of requests, i.e. Objective Request (OR), Subjective Request (SR) and Usage Request (UR). An *Objective Request* accurately and objectively describes the factual information about the product. For example, in the request "14 megapixel sensor", "14 megapixel" is the objective term used to describe the feature "sensor". This type of terms are highly domain-specific. The more ORs the query text from the customer has, in general, the higher is the expertise level. *Subjective Request* describes product features with subjective words, e.g., "high resolution" or "portable", which are generally provided by customers who are unable to name the precise requirement on a feature. SR is characterized by adjectives and adverbs in the text. This type of request is also domain-specific in general [25]. *Usage Requests* are normally from novices who are merely able to describe the usage of the product or the purpose of purchasing, for instance, "...a digital camera to take nice photo in museum" or "...taking portrait photos".

Given the three types of customer requests defined above, the tasks of constructing the product knowledge base include 1) extracting and summarizing product information from the

product database, online reviews or other product information sources; and 2) encoding obtained product information and storing it in the knowledge base in order to allow mapping between user requests (OR, SR, or UR) and product items. The mapping is used for comparison, to find the best match. In this study, information sources for establishing the product knowledge base include the product database and product reviews corpus. The former generally provides precise and objective descriptions of products, while product information in the latter is indirect, to be derived using various NLP and opinion mining approaches.

A. Encoding Product Knowledge

In this research, the definition of Feature-Opinion Pair for movie reviews mining [26] is modified to formalize descriptions of features in either product reviews or user queries.

DEFINITION (Product Feature). A product feature is an attribute of product (such as "zoom range"). It could appear in the product database, product review text, or user query text, etc.

DEFINITION (Feature Value). A feature value is the actual value related to the corresponding product feature.

A sentence in a product review can thus be represented as the set of Feature-Value pairs. For example, a sentence in a product review "Its maximum ISO is up to 6400" can be denoted by the pair ("maximum ISO", "6400"), while a sentence in a subjective query request "...a camera producing high resolution pictures" can be represented by the pair ("Resolution", "High"). Notice that the feature or value can sometimes be absent in a Feature-Value pair, which can be considered as a pair with implicit feature or value. Likewise, sentences in the query text from a customer can be encoded into a set of Feature-Value pairs. Each pair in the query is called a *request* in this paper. Specifically, a Usage Pair in the query can be represented by assigning a values of "1" to the feature, for example ("scuba diving", 1), meaning the camera must be suitable for the usage context "scuba diving".

Following the definition of OR, SR and UR, we have the corresponding concepts *Objective Pair*, *Subjective Pair* and *Usage Pair*, which are Feature-Value pairs whose value domain is objective, subjective and usage related, respectively. An Objective Pair can be extracted from a sentence in an Objective Query or the product database which provide precise description of the products. A Subjective Pair, in general, can be extracted from a sentence in either a Subjective Query or a product review text. Likewise, a Usage Pair can also be extracted from a sentence of either a Subjective Query or a product review text.

With the representation of feature-value pair, either the product information or the customer query can be represented by a set of pairs. Assuming $F = \{f_1, f_2, \dots, f_m\}$ is the set of all available features, product p can be formalized as a vector of feature-value pairs defined on a subset of F , denoted as $p = [PP_1, \dots, PP_{k_p}]$, where $PP_j = (f_{jp}, v_{jp})$, $1 \leq j \leq k_p$, is a product feature-value pair (objective, subjective or usage). Similarly, a customer query can be represented by $q = [PQ_1, \dots, PQ_{k_q}]$, where $PQ_j = (f_{jq}, v_{jq})$, $1 \leq j \leq k_q$ is a request feature-value pair (objective, subjective or usage). The similarity between a query and a product, therefore, can

be estimated by accounting for the distance between the corresponding feature values while their feature names appear in both vectors. Details about comparison of vectors are introduced in Sections 4 and 5.

B. The NLP Modules

Product databases offer well-organized and detailed descriptions of product features, which become an important information source of the product knowledge base. Capitalizing knowledge hidden in review documents, in contrast, is much more challenging since product reviews are normally free text based. In this study, NLP and text mining techniques are used in order to extract the needed information from the review corpus (i.e. the NLP module in figure 1). Given a collection of review documents about a type of product collected from the web, as well as the database of product, the data source of the NLP module is ready for the process. The procedure to extract a product KB includes the following 3 steps:

- 1) Preprocessing. The list of all products (digital cameras) is generated; each product is assigned a unique identity and its associated review articles are saved in the reviews corpus.
- 2) Annotation. This step parses review texts and annotates elements with tags. Most techniques used in this step are based on a few well-developed and widely used NLP techniques [27, 28]. It includes tokenization (breaking down the original review text into tokens such as punctuations, numbers, spaces and words, etc.), Named Entity detection (i.e. identifying entity names such as “prime lens” according to the predefined list or ontologies), Sentence-splitting (segmenting the text into sentences), and POS-tagging (based on the context and definition of a word, tagging it as corresponding to a particular part-of-speech, i.e. nouns, verbs, adjectives and adverbs). Natural Language Toolkit (NLTK [27]), an open source library, can be utilized to implement the above process.
- 3) Feature-Value pair identification. Based on the output of the previous step, i.e. review texts annotated with various tags, this step identifies the Feature-Value pairs by extracting features and their corresponding values, according to some predefined rules (such as fixed syntactic phrases, etc.) or ontologies. For instance, a feature of a product is generally a noun or noun phrases, which can be retrieved from the product feature lexicon generated from the product database. The feature value can be either adjective/adverb phrases or implicit (in the case of a usage pair). Notice that in some reviews, some Feature-Value pairs can be implicit. For instance, “I decided to sell out my original Nikon DSLR right after testing this tiny camera.” Since understanding this type of review opinion is very difficult, if not impossible, the proposed framework only deals with pairs expressed in an explicit way. The output of this step is product information encoded with the form of the vector, which consists of the ID of the product and a number of pairs describing its features. For example, “Sony W70”: [(“resolution”, “10mp”), (“portable”, “good”), ...].

Throughout the processes of Step 2 and 3, in addition, the support of ontologies is needed in order to allow identification of named entities with resembling semantics. For example, (“sensor”, “large”) and (“CMOS”, “big size”) are semantically equivalent indeed.

C. Developing Ontologies

Automatic extraction of feature names and values from review texts requires the system to understand text written in natural language, which has been known as a big challenge. Ontology, recognized as a powerful tool for understanding and capitalizing domain knowledge [29], is incorporated in this research. Ontology can help the proposed framework form an unambiguous understanding of semantics of user reviews which, in general, is unstructured information [30]. It is believed that the semantic representation of lexica plays a key role in full utilization of hidden information in the product review. It can eliminate ambiguity and help fix the imprecision or incompleteness in the review. Web ontology languages (such as OWL) can help interpret various contextual concepts related to different products.

In general, three paradigms are widely adopted for the construction of an ontology, i.e. bottom-up, top-down and hybrid approach [31]. The top-down paradigm starts with existing domain resources (such as taxonomies) and heuristic knowledge, and then increasingly provides more details afterwards. The bottom-up paradigm, on the contrary, starts from the raw documents, attempting to identify and extract lexica for the ontology. A hybrid paradigm starts from the concepts, construction and raw document extraction at the same time, and tries to establish the mappings between the ontological levels. At the beginning, words baseline occurrence rates [2] can be utilized to identify terms used to initialize the ontologies. Although much research has been done on automatic ontology construction [32], manpower is still needed for optimization and validation, so that a practical and usable ontology can be established. Several ontologies developed in this framework are as follows.

- Product ontology

The product ontology is the ontology developed for the specific product domain to support drawing of inferences from among feature terms. The hybrid paradigm can be adopted to build the ontology for the specific product. In the top-down stage, product ontologies can be constructed by capitalizing meta information of products available in the product databases, e-Commerce, or product review websites. For example, the DPreview (www.dpreview.com) website provides an updated and comprehensive review database of products related to digital photography, such as digital cameras. In many product databases, specifications such as sensor, ISO range, metering, focus mode, dimension and weight, etc., are also available in a well-structured format. Those descriptions of a digital camera constitute the features that the customer may consider and compare when about to purchase a new camera.

The output of the top-down stage is the preliminary ontology of a product, which can be used to guide the bottom-up stage. Content of review documents can be analyzed to help identify the taxonomies, synonyms and so on, from the corpus [33]. This stage further consolidates the product ontology by inserting, deleting and refining the properties in its draft version.

- Descriptive ontology

Descriptive ontology maintains semantics of subjective terms and their associations. The development of descriptive ontology also follows a hybrid approach. In the top-down stage, synsets in WordNet [34] can be utilized to generate a primitive descriptive ontology. The bottom-up stage can be

carried out along with that of product ontology since the descriptive terms are largely dependent on the specific product domain as well. For example, the feature “range of color variations” is associated with descriptive terms “wide” and “narrow”.

- Sentiment ontology

Sentiment ontology is the ontology for understanding and references about sentimental terms. Top-down approach can be adopted to develop the sentiment ontology. The foundation of this ontology is SentiWordNet [35], a lexical resource widely used for processing natural language for the understanding of sentimental terms and proven to be effective. In SentiWordNet, polarity information is quantified on the basis of the lexica in WordNet, using linguistic and statistic classifiers. And a synset in SentiWordNet is associated with three polarity scores (positivity, negativity and objectivity) and the sum of the three maintains 1. For instance, the triplet (0, .75, .25) (positivity, negativity, objectivity) is assigned to the term “poor”. Sentiment ontology can be utilized to measure the orientation of opinions towards a product or its features for deriving the implicit ranking information.

- Usage ontology

In a product review, usage ontology models the usage terms describing situations with regard to the environment in which the product performs well. For example, a review stating “especially suitable for night shot” implies the product (camera) is evaluated high in the usage context “night shot”. In a customer’s query text, similarly, context information indicates the purpose of purchase or the environment in which the product is used. For example, “...a compact camera for taking photo underwater”, in which “underwater” defines the usage environment. A well-defined usage ontology plays a key role in allowing utilization of the usage information hidden in the reviews corpus and comprehending the usage request in the query text in an unambiguous way. For example, “for outdoor”, in terms of the usage of a camera, semantically resembles to “for hiking”.

THE MATCHING ENGINE

With the representation of feature-value pair, either the product information or the customer query can be represented by a set of pairs. The similarity between a query and a product, therefore, can be estimated by the synthesis of the distance of the corresponding pairs. Various distance measures can be adopted for the synthesis. The following paragraphs introduce the distance between three types of pairs.

i) Distance between Objective Pairs

For most products, precise description of features is available in product databases provided by the manufacturer or other sources. Product information in these repositories is generally structured or semi-structured, and hence query with customers’ objective query is straightforward. Let $PP = (f, v_p)$ be an Objective Pair about a product p and $PQ = (f, v_q)$ be an Objective Pair from a query q , PP and PQ share the same product feature f . The distance between objective pairs PP and PQ is the distance between two feature values v_p and v_q , denoted as

$$\text{dist}(PP, PQ) = d(v_p, v_q).$$

When the feature is numerical, e.g., “the LCD size”, the

distance measure $d(\)$ can be simply calculated as the arithmetic distance between two numeric values standardized into the interval $[0,1]$. Otherwise, when the feature is categorical or textual (e.g., “with/without viewfinder”), one easy way to quantify $d(\)$ is to compare whether the two strings are (approximately) equivalent.

Notably, the semantic equivalence should be considered since product information may be collected from various sources. For example, “sensor size” versus “CMOS size”, and “12 megapixel” versus “12 MP”. Therefore, the definition of an ontology on the product domain is needed, and thus a graph-based approaching accounting of the traversed distance along weighted arcs in the semantic network can be used to calculate the semantic distance [36].

ii) Distance between Subjective Pairs

Unlike the Objective Pairs, directly calculating the distance between values of two subjective pairs is difficult, due to the high complexity of human language in describing subjectivity, and imprecision. Lately, a very effective solution to this issue is WordNet [34]. WordNet is a lexical database grouping English words into sets of synonyms and providing the semantic relations between these sets. For example, (“LCD size”, “big”) and (“LCD size”, “large”) can be recognized as synonyms pairs.

In the proposed framework, WordNet is used to calculate the semantic distance [37] between values of two Subjective Pairs. Let $PP = (f, v_p)$ be a Subjective Pair about a product p and $PQ = (f, v_q)$ be a Subjective Pair from a query q , PP and PQ share the same product feature f . Since subjective product information is extracted from user reviews corpus, the distance $\text{dist}(PP, PQ)$ should be considered as the average distance between PQ and all pairs related to feature f of product p in the reviews corpus. Therefore:

Let $R_p = \{r_1, r_2, \dots, r_n\}$ be a set of reviews of the same product p , and in each review $r_i, 1 \leq i \leq n$, assuming $S_i = \{s_{i1}, s_{i2}, \dots, s_{im}\}$ is the set of all sentences related to feature $f_j, 1 \leq j \leq m$, the distance between PP and PQ is the average distance, calculated as

$$\text{dist}(PP, PQ) = \frac{\sum_{i=1}^n \sum_{j=1}^m \text{SD}(v_{p,ij}, v_q)}{m \times n},$$

where $v_{p,ij}$ is the value of the pair with feature f , which appears in sentence j and review i . $\text{SD}(\)$ is the semantic difference calculated by the traversed distance in the semantic network [36].

Additionally, SentiWordNet [35] is similar to WordNet but focuses on the orientation of opinions. It is the annotation of all synsets of WordNet according to the notions of positivity, negativity and neutrality. In the proposed framework, positivity and negativity scores (i.e. $\text{Pos}()$ and $\text{Neg}()$) is specifically applied to subjective words in a product review or customer query text for estimating their opinion orientation scores. For example, the distance between (“Battery life”, “satisfactory”) and (“Battery life”, “excellent”) can be calculated accurately with SentiWordNet. A straightforward way to calculate the semantic distance of opinion orientation is:

$$\text{SD}(v_{p,ij}, v_q) = \left| |\text{pos}(v_{p,ij}) - \text{neg}(v_{p,ij})| - |\text{pos}(v_q) - \text{neg}(v_q)| \right|$$

iii) Distance between Usage Pairs

Coping with Usage Pairs in customer query is much different from Objective Pairs and Subjective Pairs since in rare cases a product specification mentions the most suitable usage scenario of the product, and only a few of product reviews actually provide comments on the usage. Hence collecting product usage information from product database or reviews corpus, in either a direct or indirect way, is quite difficult. It can be noticed that whether a product is suitable for a usage scenario depends on features it possesses. For example, a digital camera for “scuba diving” requires the camera to be with “wide ISO range”, “watertightness” and “long battery life”, etc., whereas a camera for “taking building” is normally associated with the features “wide angle” and “resolution”, etc. In fact, these relationships can be captured and modeled by processing and analyzing existing reviews corpus and product databases. As such, the usage information of a product can be derived according to its associated features using some inference models.

The Naive Bayesian method is one of the most successful machine learning algorithms in the domain of intelligent data analysis. Despite the simplicity of Naïve Bayesian (NB), it is proven to be very effective [38]. In this research, based on the strong independence assumption [39], that is, the probability of each feature is independent of each other, we establish a Naïve Bayesian model to calculate the likelihood of a product being suitable for a “usage”, denoted as $\Pr(U|p) = \Pr(U|f_1, f_2, \dots, f_k)$, where U is the dependent class variable with a number of different usage and $f_i, 1 \leq i \leq k$ is a variable representing the feature pertaining to a product p (to facilitate computation, all feature variables need to be unified to either categorical or numerical format in advance). The probability of product p being suitable for U , according to Naïve Bayesian method, can be calculated by:

$$\Pr(U|p) = \frac{1}{Z} \Pr(U) \prod_{i=1}^k \Pr(f_i|U),$$

where Z is the scaling factor depending on the $\Pr(f_1, f_2, \dots, f_k)$ only.

A model learning stage is needed for estimating various terms of $\Pr(u_j)$ and $\Pr(f_i|u_j)$. In this stage, a training dataset is generated by processing the reviews corpus and product database, and then extracting products associated with usage information. In this research, $\Pr(u_j)$ is estimated based on the fraction of products with usage u_j over the entire training dataset. Given usage u_j , similarly, $\Pr(f_i|u_j)$ can be calculated based on the fraction with feature f_i over all products with usage u_j .

Let $PP = (u, v_p)$ be a Usage Pair about a product p . Its feature value v_p can be quantified by the likelihood that product p is suitable for usage u , i.e. $v_p = \Pr(U = u|p)$. Assuming $PQ = (u, 1)$ is a Usage Pair from a query q sharing the same product feature f with PP . The distance between PP and PQ is the distance between v_p and 1, namely, $\text{dist}(PP, PQ) = 1 - v_p$.

iv) Synthesizing Distance

Notably, various distance measures normally distribute in different scales and, in addition, distance values derived by different distance measures may have distinctive amplitude

scales and baselines. For example, v_p defined above is a probabilistic value, normally very small, and thus the distance between two Usage Pairs ($1 - v_p$) has very narrow amplitude with baseline close to 1. On the other hand, the distance between two subjective pairs may have a much larger baseline since the average of the traversed distance between two concepts in the semantic network is used to estimate the distance. As such, directly synthesizing different types of distances, without normalization, is problematic because components with small distance values may be overwhelmed by those with much larger distance values. A linear transformation is defined by combining a Z-score [40] and a MAX-MIN standardization is used in this framework; the former converts the value scales to the same range about zero and the latter transforms the distance value into interval [0,1].

Let $d = \text{dist}(PP, PQ)$ be the distance between two pairs PP and PQ which can be two objective, subjective or usage pairs, and assume D is the value domain of d . Then we have:

DEFINITION (Z-score Mapping). The *Z-score mapping* is denoted as $Z: D \rightarrow D$, and for $d \in D$, $Z(d) = \frac{(d - \bar{D})}{\delta_D}$, where \bar{D} and δ_D are average and standard deviation of D , respectively.

DEFINITION (MAX-MIN Mapping). The *MAX-MIN mapping* is denoted as $M: D \rightarrow D$. For any $d \in D$, $M(d) = \frac{d - \text{MIN}(D)}{\text{MAX}(D) - \text{MIN}(D)}$, where $\text{MAX}(D)$ and $\text{MIN}(D)$ are the maximum and minimum of all $d \in D$, respectively.

Normalization Mapping, the composite of Z-score and Max-Min mappings, can be defined as:

DEFINITION (Normalization Mapping). The *Normalization mapping* is denoted as $N: D \rightarrow D$, For any $d \in D$, $N(d) = M(Z(d))$.

By introducing the Normalization Mapping on the value domain of the same type of distance, baselines of different distance definitions are standardized and their respective value scales are unified into the interval [0,1] in order to facilitate synthesizing the overall distance. This Normalization Mapping is used in Section V for presenting the overall similarity metrics.

CASE-BASED RECOMMENDATION

The traditional Collaborative filtering method is known to be very effective in making recommendations. However, cold-starts and sparsity problems are the major obstacles [5]. These are serious problems, particularly in niche markets where users are very unlikely to have rated many items. Case-based reasoning (CBR) is one of the most successful machine learning approaches to solve new problems by retrieving and adopting solutions for similar old cases [41]. CBR system is based on a repository of cases (the case base) which constitute the expertise used for solving the past problems. New problems can be solved by searching for old cases similar to the new case and hence their solutions can be adopted to solve the new problem. CBR methodology normally involves four key steps: (1) retrieve the most similar cases by comparing past cases; (2) reuse the solution associated with the matched case for solving the current problem; (3) revise the new solution if necessary, and (4),

retain it in the case base. Case-based recommender systems (CBRS) use CBR methodology for recommendations generation, in which products are viewed as cases and encoded and saved in the case base. As such, recommendations can be retrieved from the case base by searching for cases analogous to the product described in the customer request [42]. The “Alignment Assumption”[43] of CBR allows products/cases to be compared based on their features, making CBRS a promising solution to feature-based shopping guiding system. CBRS have also proven to be able to start with even a small case base [42] and, therefore, have become important alternatives to CF in many application domains.

i) The Similarity Metrics

Given $F = \{f_1, f_2, \dots, f_m\}$, the set of all available features in the proposed recommendation model, a product case p defined on a subset of F is a vector of feature-value pairs, denoted as $p = [PP_1, \dots, PP_{k_p}]$, where $PP_j = (f_{jp}, v_{jp})$, $1 \leq j \leq k_p$, is a product feature-value pair (objective, subjective or usage). We also say that the pair PP_j appears in case p , denoted as $PP_j < p$.

Likewise, a customer query can be represented by $q = [PQ_1, \dots, PQ_{k_q}]$, where $PQ_j = (f_{jq}, v_{jq})$, $1 \leq j \leq k_q$ is a request feature-value pair (objective, subjective or usage), we say that the pair PQ_j appears in query q , denoted as $PQ_j < q$.

The key step in case-based recommendation is to compare the distance between the query (normally referred to as “new case” in CBR) and the products (the “solution cases”). Hence definition of the similarity metrics is required. In real application, it is possible that some feature information required by the customer is missing in the product KB, and vice versa. Therefore, only features involved in both the user request and the product KB are considered when calculating the overall distance. Hence given query q and product case p , their *overlapping feature set* is defined as: $F_{p,q} = \{f_j | PP_j = (f_j, v_{jp}), PP_j < p \text{ and } PQ_j = (f_j, v_{jq}), PQ_j < q\}$. The overall distance between p and q can be calculated by the Weighted Euclidean Distance measure:

$$DIST(p, q) = \sqrt{\sum_{f \in F_{p,q}} w_i \cdot N(dist(PP, PQ))}$$

where $PP = (f, v_p) < p$ and $PQ = (f, v_q) < q$. w_i is the corresponding weight on the distance element and w_i satisfies $\sum_{i=1}^{|F_{p,q}|} w_i = 1$. In practice, important features can be highlighted by using a comparatively larger weight value. The similarity metric between p and q can be simply calculated as $SIM(p, q) = 1 - DIST(p, q)$, since the overall distance has been standardized into the interval $[0, 1]$ already.

ii) Matching Process based on Case-based Recommendation

The proposed framework follows problem-solving methodology similar to that used in case-based reasoning. First, a customer looking for a product is allowed to describe requirements in natural language. Depending on depth of knowledge of the domain, description of features in query text can be in objective terms, subjective terms, usage terms, or a mixture of them. For example, if a user inputs a query text “a digital camera with big LCD and at least 8 megapixels

for travel”, the text parser in the NLP module then identifies the involved features (i.e. “megapixel”, “LCD”, “travel”) and their corresponding values (i.e. “8”, “big”, and “1”, where the last is an implicit value). Ontologies are also involved in this process to deal with the synonyms. The NLP module finally encodes the query text into a new case so as to retrieve similar old cases from the case base. Three major steps are involved in this process, i.e. the input, product features retrieval, and the output.

Figure 2 illustrates the process of our case-based recommendation based on the original CBR cycle proposed in Aamodt (1994), which has been widely used in many CBR systems [43]. In this framework, the recommendation process starts with the query text input by the user, and the top-N most similar cases/products are presented after searching in the product KB, sorted by ranking scores (retrieve and reuse). The ranking process is dialog-driven, which allows the customer to interactively refine the query when the results are not satisfactory or too many recommendations are generated. Namely, the system presents a number of additional attributes related to the product category so that the user can narrow down the scope by specifying more accurate requirements. For example, if the customer finds that the recommended products are not what he/she really wants, the usage request “travel” can then be used to derive a group of associated features, i.e. “weight”, “size” and “battery life”, and thus the customer may realize that what is actually needed is “long battery life” while there is no demand on the other two features. The aforementioned Naïve Bayesian underpinned by ontologies enables this inference from the usage request to product objective features. When the customer is pleased with the recommendations, choices are saved and utilized to refine the case base (revise, review and retain). For example, the Naïve Bayesian model can be adjusted by updating the probability $\Pr(f_i | u_j)$, where f_i and u_j are the feature “battery life” and usage “travel” respectively.

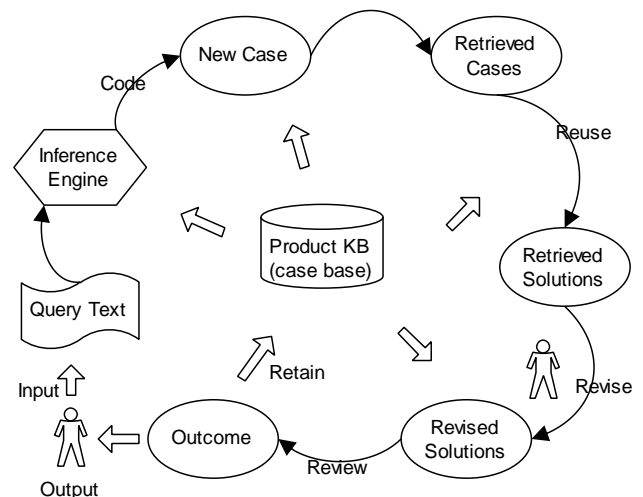


Figure 2. The process of case-based recommendation

SUMMARY AND FUTURE RESEARCH

This research introduces a novel framework for product recommendation in accordance with customer requests in natural language. It exploits NLP techniques and product opinion mining approaches to generate the product knowledge base. Several ontologies defined on the product

domain are constructed in order to support the inferences between terms with similar semantics. A case-based recommendation approach is used in this framework in order to avoid the cold-start problem in traditional collaborative filtering method. The similarity metrics used in case-based recommendation process is also elaborated. The recommender system based on the proposed framework can serve as intelligent guidance for online shoppers, especially for those without adequate domain expertise. This system will be implemented and experiments will be conducted in order to empirically evaluate the effectiveness of the framework and the associated methods proposed in this paper.

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VICTORIAN SMES' PERCEPTIONS TOWARDS IT STRATEGY FRAMEWORKS USE, BENEFITS AND BARRIERS: IMPLICATIONS FOR E-BUSINESS

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ABSTRACT

IT strategy development frameworks are crucial for adopting innovative IT and e-business solutions for SMEs. However, empirical studies on the use of such frameworks and benefit/barriers experienced by SMEs from the use of these frameworks are limited. We thus report the findings of a survey among a group of SMEs operating in Victoria. We find that only three frameworks are occasionally used by the surveyed SMEs. The implications of these findings for both IT and e-business contexts are discussed.

Keywords: IT strategy, e-business, SMEs, IT strategy development frameworks

INTRODUCTION

Worldwide, Small and Medium-Sized Enterprises (SMEs) play a significant role in strengthening national economies. They contribute enormously by offering new jobs, introducing technological improvements, increasing competitiveness, and providing more options of the services and products [16]. In Australia too, SMEs play an important role as they constitute the largest portion of the employment sector with around 3.6 million jobs and represent 95% of the total number of Australian businesses [6]. Victoria represents an important state of Australia, which according to Business Victoria (2011), had 482,883 SMEs in 2007. These represent 25% of the national total and 96% of businesses in the state.

Despite significant contributions of SMEs worldwide (including Australia), they encounter many challenges which demand for innovative IT and e-business solutions. Information Technology strategies (which also encompass e-business plans and vision) can help SMEs to improve their efficiency and competitive capabilities [3] [25] by better planning and managing the adoption and use of IT and e-business solutions. We however argue that IT/ e-business solutions and infrastructure need to be strategically managed to ensure that they provide meaningful benefits to SMEs. According to Bili and Raymond [4], effective management of IT can be greatly facilitated by developing an appropriate IT strategy following some formal approaches and frameworks. Little however is known about: (a) those IT strategy frameworks which are used by SMEs for both IT and e-business applications context; (b) how frequently SMEs use these

frameworks; and (c) the benefits and barriers they experience in using these frameworks. In addition, it is not clearly known whether SMEs' level of use of these frameworks varies depending on their size and the industry sector in which they operate. This is particularly true for Victoria whose economy is shaped by SMEs to a considerable extent. We believe that an examination of the role of organisation size and sector type on the SMEs use of IT strategy frameworks may provide IT researchers and SME management with an opportunity to improve their understanding on whether existing IT frameworks (which are primarily targeted at large organisations) need to be adapted by addressing the unique characteristics of various industries and organisation size. We have thus initiated this study (which involves developing a rigorous survey instrument that was distributed among 480 SMEs located in Victoria) in order to address the above mentioned concerns. Based on the survey responses, we have found that none of the popular IT/strategy frameworks are intensively used by the surveyed SMEs and that only three such frameworks including Critical Success Factors (CSF), Transaction Cost Economics (TCE) and Balanced Scorecard are occasionally used. Although the surveyed SMEs have acknowledged the experience of several benefits, a number of barriers are also experienced by them. Furthermore, there is evidence of the existence of significant differences in some selected benefits and barriers between manufacturing and non-manufacturing SMEs. The implications of these findings for both IT and e-business contexts are discussed.

BACKGROUND LITERATURE

IT Theoretical Foundation: Our review of the IT strategy development practices reported in the existing literature indicates the presence of a wide range of frameworks, most of which were initially developed for the large organisation context. However, several scholars e.g. [4] [20] [30], have adapted, developed and/or amalgamated some of these frameworks to suit the SME situation. These frameworks, which can be applied for e-business strategy as well, can be classified into three categories: awareness frameworks, opportunity frameworks and positioning frameworks [10]. Awareness frameworks aim to demonstrate how organisations can use IT for strategic advantage and to assist them in evaluating the impact of IT their business. This category has three subsets. In contrast,

opportunity frameworks aim at clarifying the opportunities and business objectives and specify how organisations can use IT strategically. These frameworks are more instrumental and practical than awareness frameworks. There are four subsets of this category. Finally, positioning frameworks aim to assist top management to determine the significance and characteristics of existing IT resources. They help executives to better understand IT and how it can be managed in their organisations. This category includes three subsets: scaling frameworks, spatial frameworks and temporal frameworks. Using this taxonomy, we have categorised a set of IT strategy frameworks which we have identified from the literature. This is shown in Table 1. We have included in this table many more recent frameworks which were not initially identified by [10]. However, we have only included those frameworks which are known to suit SMEs. We observe that most of the frameworks fall into the systems analysis

frameworks and business strategy frameworks categories. We also note that the suitability of some IT frameworks (in Table 1) was examined by [21] for the UK SME context. According to them, the awareness frameworks are of value for SMEs because they encourage and enable SMEs to understand their environment. These frameworks help SMEs to set their business goals effectively and to decide the changes required to achieve these goals. In the opportunity frameworks, the systems analysis frameworks and business strategy frameworks are very useful for SMEs. On the other hand, application search methods and technology-fit frameworks are less useful for SMEs because they depend on extracting information from a business strategy, which may not always exist for many SMEs. The positioning frameworks are the least applicable frameworks for SMEs, except scaling frameworks, which help SMEs to identify the role of information systems [21].

Table 1. IT strategy frameworks for SMEs based on [10] taxonomy

	Classification	Examples of Frameworks
Awareness Frameworks	Refocusing Frameworks	Strategic Opportunities Framework,
	Impact Frameworks	Porter's Generic Strategies
	Scoping Frameworks	Information Intensity Matrix, 3D Model of IS Success
Opportunity Frameworks	Systems Analysis Frameworks	Porter's Value Chain, PESTEL, Soft Systems Methodology, Strategic Options Development and Analysis
	Application Search Methods	Customer Resource Life Cycle
	Business Strategy Frameworks	Five-Forces Model, CSF, MIT90, TCE, Balanced Scorecard
Positioning Frameworks	Scaling Frameworks	Strategic Information Systems Grid
	Spatial Frameworks	Sector Information Management Grid
	Temporal Frameworks	Stages of Growth Models

IT Strategy Benefits and Barriers: When an organisation successfully uses IT strategy frameworks (Table 1), they can expect to experience a range of benefits. According to Earl [10], facilitating the alignment of IT strategy with the organisation's objectives can be considered one of the most important benefits of developing IT strategy. Levy et al. [22] argue that innovative firms usually have a strong integration between their IT strategies and business strategies, and the lack of alignment between business and IT strategies happens where firms do not recognize the role of IT in achieving a business strategy. Developing IT strategy can also provide enormous assistance for organisations to gain competitive advantages. This is particularly true for SMEs which face economic and competitive challenges [3] [17]. Enhancing organisational efficiency is a significant goal for many organisations, and by having an adequate IT strategy this goal can be achieved [23]. It has been reported that successful introduction of IT strategy helps SMEs improve their efficiency in such aspects as providing faster deliveries, enabling quick response, offering a better customer service and better decision making [3], and helping SMEs to

increase resources' utilisation and "delivery on time" [26]. IT strategy development also allows organisations to have better IT governance and to establish the required IT architectures and policies [27] [10]. Furthermore, developing an IT strategy can improve the organisation's performance such as growth of sales; availability of financial resources; profitability for the long term; and customers satisfaction [29] and enhance the organisation's ability to be innovative [21]. SMEs, according to [4], are more innovative than large organisations because of their flexibility and willingness to adopt any new approach. Moreover, the rapid change of technology can be considered as a motivator for SMEs to develop an effective IT strategy to avoid the risk of technological obsolescence [4] [31] and to overcome the most significant problem in SMEs contexts which is resources limitations [17].

The benefits (mentioned above) are often counter-balanced by barriers which SMEs face in developing IT strategy. We argue that SMEs are unable to effectively plan, control and implement their IT strategy when these barriers are not adequately addressed. Our view is in line with the opinions expressed by [4]. Based on our review of the

relevant literature, we have identified several barriers. According to Ballantine et al. [2] and Kyoep [18], absence of a clear business strategy is a major barrier to developing IT strategy for many of SMEs. SMEs usually have an implicit business strategy in their owners' minds and that is reflected on IT planning. IT planning in SMEs is focused on improving the effectiveness and efficiency of activities more than competitiveness. This focus appears as an attempt to enhance the basic administrative and transaction processes [20]. Another barrier is the limited financial and human resources which leads SMEs to use IT for operational purposes but not much for strategic purposes [17]. Vulnerability of the organisation in relation to competitive forces such as the power of customers and suppliers is another barrier, as SMEs are highly directed by the power of their key customers and suppliers [2] [4]. Lack of relevant IT experience and limited expectations of IT could hinder the development of IT strategy for SMEs [2] [17] [18]. Finally, as a result of the insufficient human and financial resources and the influence of the competitive environment, SMEs usually adopt a focus on immediate day-to-day operations and have a lack of time and other resources to develop IT strategy for long term.

Gap in the literature: We acknowledge the contribution of the scholars who have examined various types of IT strategy frameworks, their suitability for SMEs context, and how SMEs can expect to receive benefits and encounter hurdles. However, to the best of our knowledge, few empirical studies have been undertaken for the Australian context (an exception is the work of [26] which was done a decade ago). In particular, we do not know to what extent the IT strategy frameworks (which are also consulted for e-business adoption and use) are currently used by SMEs operating in Victoria and what benefits/barriers are experienced by them. Hence, there is a need to explore these issues including examining the role of SME size and industry type on the use, benefits and barriers.

RESEARCH OBJECTIVES AND HYPOTHESES

Given the literature gaps identified earlier, our research sought to explore the current situation of Victorian SMEs in relation to their level of use of IT strategy frameworks and their level of experience of perceived benefits and barriers to IT strategy development. It also aimed to determine whether there were any significant differences in the perceptions towards IT strategy frameworks' use, benefits and barriers between SMEs according to their size and industry sector.

The term 'SME' includes both small and medium-sized enterprises. For the purposes of the research, it is important to define what constitutes a 'small

enterprise' and a 'medium-sized enterprise', as these definitions vary by country. The Australian Bureau of Statistics' [1] definition of small enterprise is one that has 1-20 employees; and a medium-sized enterprise is one that has 21-200 employees. In contrast, according to the European Union's [11] definition of SMEs, small enterprises are organisations with less than 50 employees and medium-sized enterprises have 50-250 employees. The current research initially adopted the ABS definitions of small and medium-sized enterprises.

In small enterprises, due to limited resources, expertise and understanding about how to develop and utilise IT strategy, we can expect the presence of a low level of use and appreciation of benefits and barriers. Furthermore, the degree of focus on daily business operations is likely to be greater in small enterprises as opposed to that of medium-sized enterprises. This in turn could discourage small enterprises from spending time developing IT strategies. It has been reported in the literature that the pressures yielding from globalisation and the sharp advance in technology allows small organisations, which have higher flexibility than larger organisations, to respond more effectively to these pressures [12] [13]. This argument is in line with [4] who believe that SMEs, in general, are more innovative than large organisations due to the flexibility and ease of adopting any new technology/approach. Based on this argument, we can expect a significant difference in the level of use and perception towards benefits and barriers associated with IT strategies between small and medium-sized enterprises. Thus, the following three hypotheses were proposed:

- H1:** The level of use of IT strategy frameworks significantly differs between small and medium-sized enterprises.
- H2:** The level of perceived benefits from developing IT strategy significantly differs between small and medium-sized enterprises.
- H3:** The level of encountered barriers to developing IT strategy significantly differs between small and medium-sized enterprises.

The business sector in which organisations are operating can be a significant factor for their level of IT use and acceptance [14]. Furthermore, Premkumar, and Roberts [28] argue that the organisations that operate in a competitive sector will have different motivations and issues about adopting any innovation, and specifically, belonging to a high technological competitive sector will require more advanced technologies and higher amount of investment in IT compared to a lower competitive sector. Thus, we argue that the degree of competition and uncertainty is likely to be greater in

the manufacturing sector as opposed to other sectors. Moreover, the amount of investment necessary to support operations tends to be higher in the manufacturing sector. This in turn may suggest that management of manufacturing companies would be more willing to pay attention to the development of IT strategy to better align them with their business strategy. They are also more likely to appreciate the benefits and barriers to developing IT strategy. These lines of argument are in broad agreement with those suggested by [17] [19]. Therefore, the following three hypotheses were proposed:

- H4:** The level of use of IT strategy frameworks significantly differs between manufacturing and non-manufacturing SMEs.
- H5:** The level of perceived benefits of developing IT strategy significantly differs between manufacturing and non-manufacturing SMEs.
- H6:** The level of encountered barriers to developing IT strategy significantly differs between manufacturing and non-manufacturing SMEs.

RESEARCH APPROACH

We adopted an exploratory survey research approach to address our research objectives. This was because we sought to explore a current situation of IT strategy among Victorian SMEs. Our research was also designed to be a theory-building exercise because we aimed at building theoretical propositions on relationships linking organisational size and industry type with IT strategy development and the perceived benefits and encountered barriers. Therefore, according to [9] [34], an exploratory survey was quite appropriate for our purpose.

The survey instrument used in our study was developed using a rigorous three-stage process. Stage I involved a review of the relevant literature on IT strategy development in the SME context to identify a range of IT strategy development frameworks, perceived benefits and barriers. An initial survey instrument was developed from the literature review. Stage II involved the participation of three Australian academic staff (as domain experts) whose teaching experience involved IT strategy to review the content and structure of the instrument. Stage III involved the participation of three PhD students from an Australian university whose area of current research involved examining IT strategy in SMEs. These students helped us further refine our instrument by identifying those items which were difficult to understand. The refined instrument included three variables: the degree of use of participating SMEs with IT strategy development; and the degree of perceived benefits

and of barriers with developing IT strategy. The first variable was measured on 5-point scale (where 5 meant 'intensively used', 4 'usually used', 3 'somewhat used', 2 'not used at all' and 1 'unknown'). The benefits and barriers were also measured on a 5-point scale ranging from 1 'strongly disagree' to 5 'strongly agree'. In addition, a qualitative analysis of respondents' free comments was also incorporated at the end of each variable used in the survey questionnaire. This assisted us, to some extent, in exploring and interpreting the quantitative findings [9].

The contact details of the targeted SMEs were obtained through the Australian Compass Database, accessed via the State Library of Victoria. From this database, we were able to extract a sample restricted by geographic area (Victoria) and size of the enterprise. Data was collected through a postal survey. The targeted population was IT managers or members of senior management who were generally responsible for the IT function in SMEs. From this population, we selected a random sample of 480 Victorian SMEs. The unit of analysis was the senior managers of the SMEs which suggests a good quality of data source [33]. Questionnaires were distributed to these SMEs. Of the 480 questionnaires circulated, 65 were "returned to sender" due to change of address. Hence, the net sample size was thus reduced to 415. Thirty-four questionnaires were filled in and returned, yielding a response rate of 8.2%. At a first glance, although this can appear to be disappointing, but some scholars such as [15] state that there is a debate about what is a reasonable and acceptable response rate in social research. They argue that response rate for the mail survey is related to the demographics of the sample. Moreover, many IT researchers usually face a problem of low response rate. For example, the response rate in [32] study of executive information system users was about 10% and was still considered an acceptable rate. In Australia, [24] conducted a mail survey to study IT investment and had 7% response rate. According to them, the low response for a postal survey is not a surprise and is quite common in the IT area. Due to small size of collected data, the assumptions about normality and equality in variants cannot be assumed and hence, non-parametric analysis was applied using SPSS software.

EMPIRICAL FINDINGS AND DISCUSSION

A brief profile of the survey respondents and the SMEs they represented is shown in Table 2. A slight dominance of manufacturing organisations is observed in our sample. To our surprise, we did not find any organisation which was small in size according to the Australian Bureau of Statistics (ABS) definition.

Table 2. Characteristics of Responding Organizations

Characteristics	Frequency	Percent	Characteristics	Frequency	Percent
Job Title			Industry Sector		
IT manager	19	55.9	Manufacturing	23	67.6
Director	9	26.5	Non-Manufacturing	11	32.4
Finance Manager	6	17.6	Service (4)		
Number of Employees			Construction (3)		
> 20	0	0	Retail (2)		
20–50	6	17.6	ICT vendor (2)		
51–200	28	82.4			

A summary of how the surveyed SMEs are using IT strategy development frameworks is shown in Table 3. The findings indicate that none of the IT strategy development frameworks (identified in the background literature section) are intensively used by the surveyed SMEs. One qualitative question asked the respondents to add any further comments about IT/strategy development in their SMEs. Some of the respondents acknowledged that these frameworks are well recognised in the academic discipline but are less known in the SME context under these terms and names. Furthermore, some respondents reported that these frameworks could be more applicable for large organisations rather than SMEs. These views expressed by some survey respondents shed insight into the limited use of IT strategy development frameworks among the SMEs. Table 3 further indicates that as opposed to awareness and positioning frameworks, opportunity frameworks tend to be the most popular frameworks, although they are occasionally used by SMEs. In particular, the subset of business strategy frameworks and application search methods seem to be known to SMEs. The popularity of business strategy frameworks is consistent with the observations of [21]. However, unlike their finding, awareness frameworks were not being used by our responding SMEs.

As indicated earlier, all the surveyed organisations were from medium-sized enterprises, according to Australian (ABS) definition of SMEs. As such, it was not possible to make direct comparisons between small enterprises and medium-sized enterprises regarding their use of IT strategy frameworks. Thus, drawing on the [11] definition, a comparison was made between small organisations (fewer than 50 employees) and medium organisations (between 50 and 250 employees) to find out the influence of organisation size on the use of three frameworks which were found to be used by the surveyed SMEs. The results of the Mann-Whitney test indicate that organisations with fewer than 50 employees use significantly less such frameworks as the TCE (Mann-Whitney $U=41.5$, Wilcoxon $W=62.5$, $Z=-1.99$, $p=0.046$) and CSF methods (Mann-Whitney $U=43.0$, Wilcoxon $W=64.0$, $Z=-1.90$, $p=0.05$) than do

organisations with more than 50 employees. Regarding industry sector, no significant difference was observed between manufacturing and non-manufacturing SMEs. Hence, hypothesis H1 was accepted but hypothesis H4 was rejected.

Table 3. Degree of Use of IT Strategy Development Frameworks

Subset	Framework	Mean rating
Business	Balanced Scorecard	2.55
Strategy	CSF	2.97
Frameworks	TCE	3.00

The perceived benefits of developing IT strategy by the surveyed SMEs are summarised in Table 4. A broad agreement with all the key benefits identified from the literature is observed. The top three benefits were: (a) IT strategy enables achievement of organisational efficiency; (b) IT strategy facilitates alignment between business and IT strategies; and (c) IT strategy improves organisational performance. In contrast, enhancing organisation innovation and overcoming the resource limitation were ranked the least important benefits for these SMEs.

Table 4. IT Strategy Perceived Benefits

Perceived Benefits	Mean Rating
Enables achievement of organisational efficiency	4.40
Facilitates alignment between business and IT strategies	4.20
Improves organisational performance	4.11
Provides a competitive advantage	3.88
Helps avoid the risk of technological obsolescence	3.79
Enhances IT governance	3.70
Helps overcome resource limitations	3.76
Enhances organisational innovation	3.61

The top three benefits are consistent with the view of [4] who argued that SMEs use IT to help SMEs

improve administrative work. In particular, the significance of organisational efficiency for SMEs is supported by [3] findings. They found that efficiency received a high priority in terms of on-time delivery, better decision-making, improved supply chain management, enhanced customer satisfaction, lower cost and reduced paperwork.

To examine the influence of industry sector on the level of perceived benefits of developing IT strategy, a comparison was made between the manufacturing and non-manufacturing industry sectors. The results suggest that in general, as opposed to manufacturing SMEs, non-manufacturing SMEs perceived greater benefits. In particular, non-manufacturing SMEs perceived greater intensity of benefits with: (a) alignment between business and IT strategies (Mann-Whitney $U=62.5$, Wilcoxon $W=338.5$, $Z=-2.53$, $p=0.011$); and (b) obtaining competitive advantage (Mann-Whitney $U=77.5$, Wilcoxon $W=353.5$, $Z=-1.92$, $p=0.05$). The observation that non-manufacturing companies expected greater alignment between IT strategy and business strategy than manufacturing companies is surprising given the prevailing evidence about the existence of a high level of IT strategy alignment in the manufacturing SMEs [7]. One possible explanation could be that the collaboration between business and IT/IS senior management in non-manufacturing SMEs is greater than in manufacturing SMEs. However, further investigations are required to examine this view. The significance of gaining a competitive advantage for non-manufacturing organisations could be due to the high degree of competition in this industry sector (due to the emergence of many dot.com companies) compared to the manufacturing industry. We argue that unlike manufacturing sector organisations, the non-manufacturing sector does not require extensive resources, which in turn attracts many new entrants. Nevertheless, in-depth study is needed to further examine this finding. In contrast, no significant difference was found between small enterprises and medium enterprises regarding their level of perceived benefits. In other words, organisation size was not found to have an influence on the perceptions of the participating SMEs towards benefits of developing IT strategy. Hence, hypothesis H2 was rejected and hypothesis H5 was accepted.

The results, as presented in Table 5, indicate that the surveyed SMEs agreed with most of the barriers hindering their IT strategy development reported in the literature. Vulnerability regarding competitive forces such as the power of major customers and suppliers was the only barrier which was not considered to be important by the responding SMEs. The most important barrier was the SMEs' resource limitations. This was followed by two barriers that each received approximately the same mean score: SMEs' lack of time (mean score: 3.73) and their focus on day-to-day operations (mean score: 3.70).

The lack of relevant IT experience and absence of a clear business strategy were the next most important. The findings show that the limited and insufficient resources of the responding SMEs was considered as the most significant obstacle which hinders developing IT strategy. This observation is consistent with the findings of [2]. However, the finding is different from what has been reported by [3], who found that the most significant problem for SMEs was the absence of a clear business strategy. In our study, this barrier appeared to be less encountered by the responding SMEs. Other major barriers for the surveyed SMEs were lack of time and primary focus on day-to-day operations. These two barriers could be a result of limited resources. The lack of financial and human resources could increase the workload of employees and managers and that could lead to lack of time and focus on responses to immediate daily demands.

Table 5. Barriers to IT Strategy Development

Encountered Barriers	Mean Rating
Limited financial and human resources	4.0
Lack of time	3.73
Focus on day-to-day operations	3.70
Lack of relevant IT experience	3.38
Absence of a clear business strategy	3.20
Vulnerability of SMEs regarding competitive forces	2.91

To evaluate the influence of organisational size on the extent to which SMEs encounter these barriers, a comparison was made between small enterprises and medium-sized enterprises. The results indicate that small organisations are significantly hindered by a lack of relevant IT experience (Mann-Whitney $U=41.5$, Wilcoxon $W=447.5$, $Z=-2.01$, $p=0.044$), lack of time (Mann-Whitney $U=32.0$, Wilcoxon $W=438.0$, $Z=-2.46$, $p=0.014$), and focus on day-to-day operations (Mann-Whitney $U=34.5$, Wilcoxon $W=440.5$, $Z=-2.35$, $p=0.019$) more than the medium-sized organisations. The other barriers have the same level of significance for both categories of organisations. Another comparison was made to evaluate the industry sector influence, but no such significant difference was found between manufacturing and non-manufacturing organisations. Thus, hypothesis H3 was supported and H6 was not supported.

CONCLUSION

E-business is a major component of SMEs' IT strategy. Hence, understanding e-business vision and plans would demand investigating how IT strategies are developed by SMEs. Towards addressing this goal, we have reported the current status of the use of IT strategy among a surveyed sample of Victorian

SMEs. We have further presented their perceptions towards benefits and barriers towards using such IT strategy frameworks. We found that SMEs do not intensively use IT strategy development frameworks cited in the literature, and that only three such frameworks including CSF, TCE and Balanced Scorecard were occasionally used by these SMEs. The SMEs agreed on a range of identified IT benefits including achieving organisational efficiency, facilitating alignment between business and IT strategies and improving organisational performance. Despite such benefits, the surveyed SMEs encountered most of the IT strategy development barriers reported in the literature, however they suffered most significantly from their resource limitations, lack of time and their focus on day-to-day operations. We further observed a mixed influence of organisation size and industry type on the extent SMEs use IT strategy frameworks and perceived benefits/barriers from such use. Hence, the controversy about the role of organisation size and industry type was not fully resolved. Despite this, we still believe that our findings bear implications for e-business adoption by SMEs. One implication is that SMEs may tend to evaluate their e-business adoption decision using such economic lens such as TCE and may consider placing emphasis on the success factors using CSF approach. Second implication is that using IT strategy frameworks by SMEs may help them to have better alignment between their business goals and aims of their e-business solutions. Another implication is that resource limitations and excessive focus on daily business operations may take away SMEs' efforts into wanting to introduce innovative e-business solutions.

Although our research is useful, it suffers from some limitations which require further attention. Due to the small number of respondents and the geographic limitation to Victoria, the research findings have limited generalisability. All respondents were from medium-sized enterprises according to the Australian SME definition; therefore, these results cannot be applied to small-sized enterprises with full confidence. Further similar survey research within Australia and globally is needed to know the extent to which these findings can be generalised more broadly.

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KEY FACTORS AFFECTING PURCHASE INTENTION IN E-COMMERCE

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ABSTRACT

Thailand E-Commerce market has progressively grown in the last decade. However, most Thai consumers still hesitate to complete online transaction because of their perceived risk and lack of trust in Thai vendors. This paper aims to investigate the structural model which pertains to the perceived risk and lack of trust that affect Thai consumers. The purpose of this study is to understand the main factors that affect consumers' purchasing intention in both perceived risk and trust.

Key words: *E-commerce in Thailand, Online marketing, Purchasing intention, Perceived risk and Trust*

1. INTRODUCTION

During 2000-2010, the advancement of the Internet has considerably influenced both human lifestyles and business management. The Internet makes it possible to connect people around the world. As the consumers became more comfortable and actively involves with one another, they began to use the Internet to access the information from anytime and anywhere [20]

According to report of Internetworldstats, The total number of global Internet users in 2010 was over 2 billion; an increase by approximately 20% compared to 2009. In Thailand, there were around 24 million Internet users or about 40% of the population. The large number of Internet users opened up wide opportunities for Thai entrepreneurs and businesses. The Internet has allowed them to reach wider audiences and deliver their products and services to customers worldwide.

However, majority of Thai consumers still hesitate to make purchases via the Internet due to two main reasons. First, the concern of the risk involve with the —online” transaction

Second, the lack of trust in the Thai e-commerce vendors. In general, Thai consumers are more concerned with the risk involved in conducting an online transaction and they do not trust most of the Thai vendors that offer their services online. Hence, although the numbers of the Internet users have increased, the size of E-commerce market in Thailand, particularly in B2C, has surprisingly diminished over the past few years. [21]

Therefore, this paper aims to investigate the factors that influence a lack of trust and the perceived risk amongst Thai consumers, which impeded the growth of E-commerce market. The rest of this paper is structured as follows. First, relevant literatures are reviewed. Second, research methodology is delineated. Third, analysis results are presented. Finally, discussions and recommendations are made for Thai entrepreneurs concerning their e-commerce strategy to develop trust.

2. LITERATURE REVIEWS

Since this study aims to investigate factors affecting perceived risk and trust, Theory of Reason Action (TRA) by Ajzen and Fishbein is considered a good start. Ajzen and Fishbein stated that the actual human behavior is influenced by beliefs, attitude and intention. [1]

For this study, we investigated the effects of attitude (perceived risk and trust) concerning behavior to intention for the behavior (intention to buy).

Perceived risk

Yoon (2002) says that due to the difference between online store and conventional store in location, staff, and emotion in purchasing, consumers can't consider quality and service of product through the online store. This leads to worry in product purchasing and later become to risk. [33]

Kim et al. (2008) point out that different purchasing channels make the customer's purchasing intention of product and service varies. Customer believes that the purchasing from traditional store, such as Wall Mart, will enable customer to walk around the store, touch, and test the product before making the purchase decision. So, this kind of store can reduce perceived risk while internet store's customers have to provide their personal data namely address, telephone number, and credit card data. This makes customers feel more risk in online transaction than conventional purchasing channel and causes the decrease in the intention to buy. Therefore, perceived risk has a negative impact on online transaction. [15] In addition, Park et al. (2005) and Vijayarathy and Jones (2000) say that the customer's perceived risk has a negative impact on website and is a significant factor of purchasing decision via internet. [24] [30]

In summary, perceived risk relates to desire and intention to do the online transaction, leads to the hypotheses as below.

H1: Perceived risk negatively affects intention to buy the product and service.

Trust

Liu et al. (2005) says that one of the tools that the internet store should value to reduce customer's concern and worry about product purchasing is building credibility. The intention to buy will increase when customers trust sellers. [19] Consequently, trust is not only the factor benefiting the conventional channel, but also the significant driver in creating the intention to buy via online store [8]

Furthermore, Kim et al. (2008) says that trust relates to the purchase intention. If the customers have a high trust in the online seller, they will have a high intention to do the online transaction. [15]

In summary, trust relates to the intention to purchase the product via internet, leads to the hypothesis as below.

H2: Trust positively affects intention to buy the product the product and service.

However, There are many studies, including Kim (2005) , Kim et al. (2008), and Walczuch and Lundgren (2004) [14] [15] [31], collecting and classifying the antecedent factors that can manage the risk and help creating the trust of customer in product and

service purchasing via internet into 4 categories, which are:

1. Cognition-based factors are factors that emerged inside the person through watching, hearing, and touching the website directly. These factors include information quality, privacy and security protection, system reliability, and web interface design.

2. Affect-based factor are factors that emerged from hearing other person's opinion which is the indirect interaction. These factors include web reputation, recommendation, and positive E-Word of mouth.

3. Experience-based factor are factors that emerged from experiencing since the past to the present and is also an experience that related with the website or the online purchasing such as internet experience.

4. Personality-based factor are factors that emerged from personality and personal behavior such as shopping style.

In this study, the researcher desires to select the cognition-based factor including information quality, privacy and security protection, and web interface design and also chooses the affect-based factor including web reputation and positive E-Word of mouth.

The researcher selects these two factors to study the effect of customer's perceived risk and trust of the online store that affecting the purchase intention because these factors are easy to control and implement, which are different from the experience-based and personality-based factor that emerging from the person and hard to control. [15]

Furthermore, the positive E-Word of mouth factor also is the additional factor from the past study because the study in the relationship between the positive E-Word of mouth and the perceived risk and trust that affecting the purchase intention via internet is not concrete enough. Also, it is the factor that has the greatest effects on the purchase intention via internet [22] and it is the first priority of entrepreneur and marketer in creating the business strategy. [3] All of these lead to the interesting of this research.

Thus, as a result of decreasing perceived risk and increasing trust, other related factors will be added with a total of five factors separated into two parts: cognition-based and affect-based factors. The first set of variables composes Information Quality, Perceived Privacy and Security Protection and Web Interface Design. The second set composes Web Reputation and Positive E-word of Mouth.

2.1 Cognition-based factors

Information quality

Information Quality is the customer perceptions when they visit and access to e-commerce website. For example: company profile, members and teams, corporate policy etc. [15] It is a critical factor for building initial trust in shopping website. [27]. Consequently, Information Quality has a positive relationship with trust. [18] Furthermore, the high level of Information Quality decrease Uncertainty and Risk perceived by customers who conducted an internet transaction on an e-commerce site. [15] In addition Park and Stoel (2002) found that product and service information in apparel shopping website, for example size, price and color, etc., can help alleviate customers' anxiety. Consequently, Information Quality efficiently decrease perceived risk which has a mutually negative relationship. [25]

Based on the above literature review, the following hypotheses are proposed.

H3a: Information Quality negatively relates with perceived risk.

H3b: Information Quality positively relates with trust.

Perceived privacy and security protection

The second factor is Perceived Privacy and Security. Privacy and security problems concern the acts of violations without owner's permission in personal data and information. The problems have occurred more often, and companies should pay careful attention. [19] Chellappa and Pavlou showed that if a website provides some kinds of privacy policy or security guarantees, customers tend to trust the website more than a website which does not provide any guarantee. measurement as well as showing some level of guarantee that there are some security policy such as encryption accessing, SSL protection etc. [6] Thus, the more privacy and security protection is offered, the more likely it is that customer trust will increase. [29]

However, customers hardly know what company does with their personal information. Many are afraid that their private information, such as profile, address, telephone number, e-mail and financial statement by credit card will be misused. Hence, they are more afraid and hesitant to provide their information to the company. Conversely, if hidden information is properly

protected, customers' risk will diminish. Perceived privacy and security protection could, therefore, negatively relate to perceived risk. [15]

Based on the above literature review, the following hypotheses are proposed.

H4a: Perceived privacy and security protection negatively relates with perceived risk.

H4b: Perceived privacy and security protection positively relates with trust.

2.2 Affect-based factors

Web interface design

When visiting website, interface design is the first component which attracts customers' intention and accelerates their initial trust. [10] According to Chen (2006), what factors influence to customers' trust in browsing the website, the finding shows that website characteristics significantly affect trust. They are functionality, usability, efficiency, reliability and likeability. Not only these five factors but colors, layout and graphic design are also included. Consequently, trust is obviously increased by constantly superior transaction system and ease of use in shopping website. [7]

Moreover, web interface design could alleviate perceived risk mentioned by Chang and Chen (2009). They said that web interface is designed with high quality which is comfortable and enable its shoppers to navigate easily. These characteristics make customers feel that the website is user friendly and can be trusted with the secure financial payment and securely keep their personal information. On the other hands, websites which are not well designed could cause their customers an uncomfortable feeling and in turn lead to perceived risk. [5]

Based on the above literature review, the following hypotheses are proposed.

H5a: Web interface design negatively relates with perceived risk

H5b: Web interface design positively relates with trust.

Web reputation

Although company reputation is an intangible asset, it can be used to generate corporate value and contribute to additional social capital for long-term business. [11] Good reputation is also one of the important factors that top executives should be concerned with. [4]

Furthermore Fung and Lee (1999) said that the reputation of a company and their website caused by two factors able to increase trust that the consumers have for their business. The first one is actual brand which refers well-known and prestige corporate. The latter one is called third-party organization that ensures trustworthy of E-commerce companies such as Visa, Microsoft etc. [10]

Past research on trust perception of first time American consumers found that famous brand and perceived reputation can increase customer trust. Brand and perceived reputation help ensure that initial viewers who have no experience with E-shopping feel more secured with the website. It can be inferred that website reputation positively relates with trust. [16]

Nevertheless, web reputation negatively relates to perceived risk. Resnick et al. (2000) gave Ebay as an example. From the Ebay case, it can be seen that after the implementation of reputation system, customers felt more confident with sellers and their products and in turn decrease their perceived risk. [26]

Based on the above literature review, the following hypotheses are proposed.

H6a: Web reputation negatively relates with perceived risk

H6b: Web reputation positively relates with trust.

Positive E-word of mouth

Online website not only contains lots of product information but also plenty of product knowledge and stories from customers who log on to share their experience each other via

blogs, forums as well as other social websites. [17] These information originated by customers are beneficial for buying decision-making [32] and is more trusting than those released by company. [2] As an influential instrument of marketing communication strategy, positive E-word of mouth is dramatically used by marketers and companies. [9]

Additionally, E word-of-mouth positively relate to perceived trust by buyers. [31] Casal'o et al. (2008) studied how E-word of mouth affects online banking business and found that buyers are unable to touch intangible service, and so they have no confidence in the Internet. Hence, opinions and positive E-word of mouth in online society are capable to increase consumer trust. [3]

On the other hand, perceived risk could be diminished by increasingly positive E-word of mouth [28]. Ha (2006) showed that positive E-word of mouth is able to successfully lessen perceived risk of product performance, not even financial risk, psychological risk and time risk. It can be inferred that positive E-word of mouth and perceived risk of customer has negative relationship. [12]

Based on the above literature review, the following hypotheses are proposed.

H7a: Positive E-word of mouth negatively relates with perceived risk

H7b: Positive E-word of mouth positively relates with trust.

From all hypotheses, the research framework was drawn as shown in Figure 1.

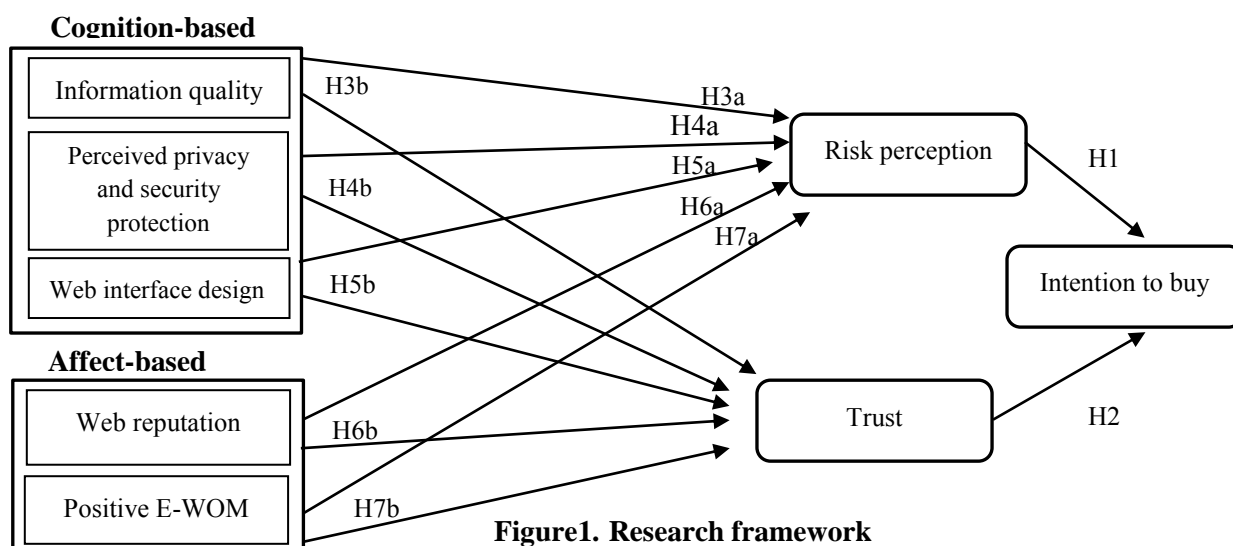
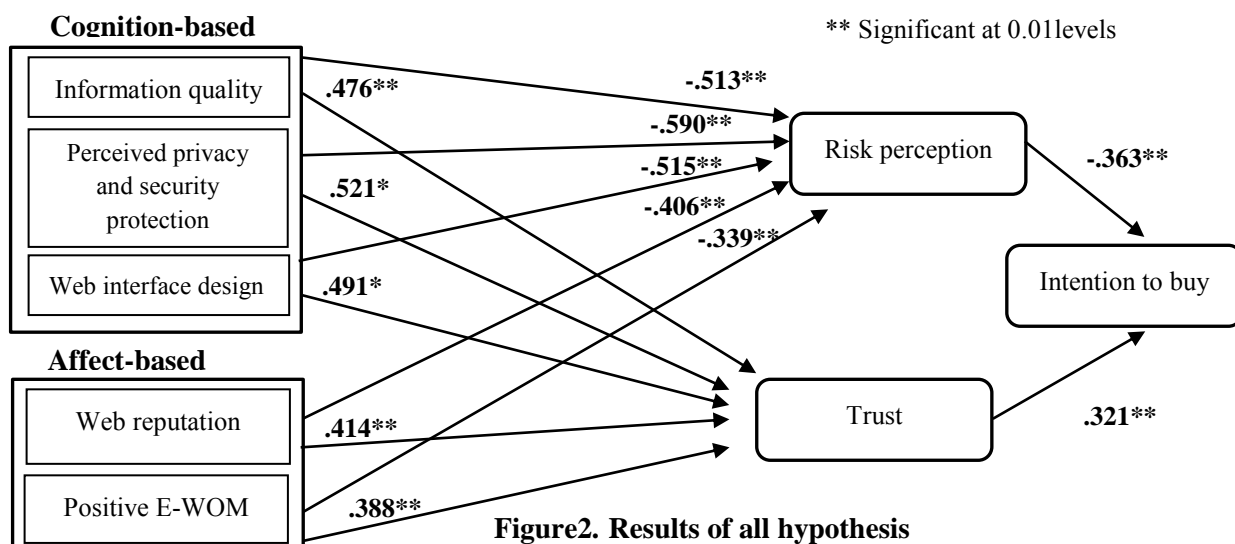


Figure1. Research framework



3. METHODOLOGY

Survey research is considered appropriate to investigate factors influencing purchase intention by Thai customers. Data was collected from 400 online Thai shoppers via online questionnaires. Correlation analysis was conducted to test the relationship between five antecedent factors and independent variables (perceived risk and trust). Then, multiple regression analysis was tested between perceived risk and trust as independent variables and Intention to buy as a dependent variable.

4. RESULTS

4.1 Reliability Test

From Figure1, eight factors were tested for reliability using Cronbach's Alpha. The results show that all factors are highly reliable because their coefficient's alphas are more than 0.6 and approach to 1. [23] Table1.shows the results of reliability test of each construct.

Constructs	Conbach's Alpha
Information Quality (IQ)	.602
Perceived privacy and security protection (PSP)	.714
Web interface design (WID)	.784
Web reputation (WR)	.748
Positive E-word of mouth (PEWOM)	.867
Perceived risk (RP)	.811
Trust (T)	.790
Intention to buy (ITB)	.932

Table1. Conbachh's Alpha of each construct

4.2 Hypotheses Test

All hypotheses are accepted and classified in two dimensions: The first dimension analyzed by correlation analysis and the second one analyzed by multiple regressions. The result was drawn in Figure 2.

4.2.1 Correlation analysis

Correlation analysis statistic measured by Pearson Correlation and Bivariate Analysis shows that all five antecedents are significantly negative related to perceived risk. However, outcomes are different in each factors: PSP (-.590), WID (-.515), IQ (-.513), WR(-.406)and PEWOM (-.339), respectively.

Whereas, another five antecedents are significantly positive related to trust. Outcomes are various: PSP (.521), WID (.491), IQ (.476), WR (.414) and PEWOM (.388), respectively.

4.2.2 Multiple regressions

Multiple regressions statistic shows that perceived risk has a significant negative effect on intention to buy which equal to -.363 while trust has a significantly positive effect on intention to buy which equal to .321. Despite of their composed direction, both perceived risk and trust have the approximate degree.

From all hypotheses, the summary of results was shown in Table 2. as follow.

Hypothesis	Result
H1: Perceived risk negatively affects intention to buy the product and service.	Accepted
H2: Trust positively affects intention to buy the product the product and service.	Accepted
H3a: Information Quality positively relates with trust.	Accepted
H3b: Information Quality negatively relates with perceived risk.	Accepted
H4a: Perceived privacy and security protection positively relates with trust.	Accepted
H4b: Perceived privacy and security protection negatively relates with perceived risk	Accepted
H5a: Web interface design positively relates with trust.	Accepted
H5b: Web interface design negatively relates with perceived risk	Accepted
H6a: Web reputation positively relates with trust.	Accepted
H6b: Web reputation negatively relates with perceived risk	Accepted
H7a: Positive E-word of mouth positively relates with trust.	Accepted
H7b: Positive E-word of mouth negatively relates with perceived risk	Accepted

Table2. Summary of results

5. CONCLUSIONS AND FUTURE WORK

5.1 Research findings

• General perspective

- Although all hypotheses are accepted, web Reputation and Positive E-word of Mouth are less influential on risk when compared to other antecedent factors.

This shows that although the website is being recognized and highly praised by a group of people and also has a lot of positive E-word of mouth, but the perceived risk of customer is not reduced greatly when compared with the quality information of the website, its customer's data protection and security system, and the well-organized web page, as opposing to Herr et al. (1991), which say that the information customer received from this E-word of mouth has more impact on the customer's attitudes and intention to

purchase the product than the information received directly from the marketing communication by the brand or the firm. [13]

- Perceived risk of Thai people to online shopping is still higher than foreigners, as opposing to Kim et al. (2008) [15], due to the lack of online shopping experience and the inefficient technology for protecting privacy and security system.

• Marketing perspective

As gender and age are different, the relationship between positive E-word of mouth and perceived risk /trust is dissimilar in two points.

- SEX: Females are more influenced by positive E-word of mouth than males do, related to their perceived risk.

- AGE: People in the aged of 24-35 are more influenced by positive E-word of mouth than people in the ages of 18-23, related to their trust.

As gender and age are different, the effect of perceived risk and trust on purchasing intention is dissimilar in two points.

- SEX: Males tended to be affected more by perceived risk than females do.

- AGE: E-shoppers in the age of 24-35 tended to be affected more by perceived risk than those in the age of 18-23.

5.2 Theoretical and practical contributions

• Theoretical contributions

This study made various theoretical contributions as follows:

- The finding could help improve and provide technological knowledge of E-commerce for studying in context of E-Trading in Thailand in the near future. For example, although Positive E-WOM and reputation are not the most important factor affecting the perceived risk and trust but they are still being the living area and a part of people nowadays. So, a strong social online-community will have an effect on the intention to purchase at last.

- Clarifying Thailand's consumer behavior: Perceived risk and Trust are key factors that have significant effect on online decision-making process.

- Presenting instruments to decrease perceived risk and increase consumer trust in online shopping. It is the instrument to develop the website both in terms of functional, including the quality of website and the protection and security system, and in terms of emotional started with the E-word of mouth, that arousing the customer to test the

product and service.

• Practical contributions

This study made various contributions as follows:

- It suggests that web designers pay more attention to the privacy and security system, information quality and website interface issues, when designing an e-commerce site for Thai e-shoppers. In addition, the research suggests that Thai business owners in B2C and entrepreneurs in C2C prioritize. This study made various contributions.:

It suggests that web designers pay more attention to the privacy and security system, information quality and website interface issues, when designing an e-commerce site for Thai e-shoppers. In addition, the research suggests that Thai business owners in B2C and entrepreneurs in C2C prioritize the basic quality of using such as an accessible and stable website and an easy-to-use interface. Then web designers should create the difference from other websites and initiate the long-term competitive advantage such as the well-organized ordering system that reducing the process and increasing more convenience to the customer. As follows, to communicate value by influencer marketing is a crucial factor to be concerned.

Furthermore, we made suggestion on how to apply the E-word of mouth marketing strategy to efficient implementation the e-commerce website the mark

- Delivering unique value to each different target groups: students either or working officers

Finally, practitioners should pay attention on gender, age, and occupation of e-shoppers as these factors affect the degree of influence of e-word of mouth on Thai e-shoppers' intention to buy.

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THE FIT OF MOBILE WORK SUPPORT FUNCTIONALITIES WITH PHARMACEUTICAL SALES-FORCE WORKER TASKS

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ABSTRACT

This paper reports on research which sought to identify and understand why specific mobile work support functionalities are a good fit with mobile work tasks of pharmaceutical sales-force. The findings from the case interviews support the notion that specific mobile work support functionalities are useful and in some instances innovative in improving customer service, communication with customers and colleagues, reduce double-handling of data entries, and facilitate the handling of administrative work during dead times. This research also identified that mobile work support functionalities such as location-related services and mobile job scheduling and dispatching of work are not a good fit and are likely to be strongly resisted by sales-force workers.

Keywords: Mobile computing technologies (MCT), task-technology fit, pharmaceutical sales-force work, usefulness of MCT support functionalities, innovativeness of MCT.

INTRODUCTION

Background to the study

There are over 38,000 pharmaceutical drugs available in Germany [9], hence a physician cannot know all these drugs and their pharmacodynamics in detail. Furthermore, German “Heilmittelwerbegesetz” (Law on advertising in the healthcare system) does not allow a pharmaceutical company to advertise drugs directly to patients [3], hence a sales force is needed that informs target physicians about pharmaceutical products that are available in the market place. A pharmaceutical company’s sales and marketing strategy is put in practice when the sales-force worker is visiting the physician to inform him/her about the company’s products, medical education programs, clinical trials etc.

The innovative use of MCT is expected to add value for pharmaceutical sales-force workers by (1) reducing paper-based work, (2) by providing online access to a company’s systems and the internet during ‘dead times’ and (3) by enhancing existing business processes. Nevertheless, a wide-spread diffusion of MCT within pharmaceutical companies in Germany has not taken place yet [6]. As sales and marketing functions of pharmaceutical companies traditionally rely on specialized sales-force activities, the innovative use of MCT provides the opportunity to increase work performance of pharmaceutical sales-force workers [5] and thereby contribute to the operational efficiency and competitiveness of a pharmaceutical company [25]. This research aimed to determine what and understand why tasks of

pharmaceutical sales-force workers are a perceived good fit with the use of mobile work support functionalities, and their degree of innovativeness.

This paper is structured as follows. First, relevant background literature is reviewed to provide a context and justification for the mobile work support functionality framework and task/technology fit theory used in this research. Then, the main objectives and research questions of this phase of the research project are outlined. Next, we describe and justify the methodological approach deployed for this research. Then, the key findings of the first phase of this research are presented and discussed in the context of existing literature. Finally, we conclude with the contributions of this research and implications for existing knowledge and practice.

LITERATURE REVIEW

Mobile computing

A broad definition [4] defines mobile computing systems as “computing systems that may be easily moved physically and whose computing capabilities may be used while they are being moved. Examples are laptops, personal digital assistants (PDAs), and mobile phones”. Mobile computing should not replace but complement desktop computing while the main difference between both forms of computing is the fact that desktop computers have a fixed location (the user’s desk) and are not supposed to be moved [17].

Innovative use of mobile computing technologies

As the usage of a technology alone does neither imply that it is used in an innovative way nor that does it imply performance impacts, this research investigates the use of MCT in a large pharmaceutical company and to what MCT is considered to be useful and potentially innovative[2]. The term technological innovation refers to the embodiment of new technologies in products/services and/or their production and delivery systems. This usage refers to a firm-level phenomenon with commercial or strategic aims [2]. Innovation can lead to increased organizational performance when introducing changes to a firm’s activities, like e.g. new or improved products or processes, investments in new machines, marketing expenditures, investments in training, the creation of intellectual property or the purchase of technology [24].

In the case organization where this research was conducted, it is assumed that MCT are not used innovatively at present. Based on the existing literature, Mobile Computing Technologies is defined as having the following characteristics:

- A computing hardware and systems that can easily be moved and used while on the move, have wireless access to the internet and a company's intranet, are based on most current hardware and use wireless broadband bandwidth (at least 3G).
- It fulfills the definition of a technical innovation as the 'the embodiment of technical advances or new technologies in products/services and/or their production and delivery systems' in the context of this research (cf. [23],[20],[4]).

Nature of pharmaceutical sales-force work in Germany

Functionalities provided by the use of MCT must address the specific nature of pharmaceutical sales-force work in Germany. Pharmaceutical sales-force workers are considered to be mobile workers as they are working away from their office desk for more than 20% of their working day [11]. As pharmaceutical sales-force workers are mainly dealing with information, ideas, and expertise in their mobile work setting, they can be considered mobile knowledge workers [33]. They have many working locations inside a geographically limited area and thereby the 'yo-yo' metaphor is applicable [20]. The main purpose is to promote pharmaceutical products ('detailing') and maintain and enhance customer relationships by visiting traditional customers in the German pharmaceutical market like physicians, hospitals and pharmacies [9].

A technology like MCT per se is not the silver bullet to solve all business problems. Instead, it must facilitate and reduce specific business problems and must be adjusted to the sales-force worker's needs. [5] identified three main issues pharmaceutical sales-force worker face in their mobile work setting, namely (1) large intervals of time between sales calls, (2) high costs associated with travelling and waiting time and (3) raised regulatory pressure on physicians' prescribing freedom. [21] conducted a survey of physicians with the aim to analyze the expectations and attitude towards pharmaceutical sales-force workers. Several issues that marketing and sales teams of pharmaceutical companies need to consider have been identified, namely:

- Physicians want most of all unbiased, evidence-based scientific information about products including head-to-head comparisons as well as risks and side effects [21].
- In order to make the interaction with the sales-force worker more valuable, a substantial 57 percent of physicians are willing to spend more time with representatives who bring additional information and value added services [21].
- Thirty-eight percent of the physicians surveyed have decided ... to make less time for sales-force worker [21].

This research assumes that the use of MCT has the potential to add value to pharmaceutical sales-force work tasks and thereby help to improve the relationship between sales-force worker and physician.

Mobile work support functionalities

In order to examine the perceived fit of MCT with pharmaceutical sales-force worker tasks, this research focused on gaining a deeper understanding of pharmaceutical sales force workers' perceptions of the usefulness of six mobile work support functionalities which is a sub set of MCT [34]

defined as:

- Mobile communication to interact with their colleagues and their clients through voice and text messages.
- Mobile information searching to obtain time-critical information in real-time in a mobile work setting.
- Mobile transaction processing of routine organizational and business transactions on the spot in a more efficient and cost effective way.
- Location-related services providing job-related location information and showing the availability of certain resources or colleagues that are within reach.
- Mobile job scheduling includes both scheduling of shared resources (like e.g. equipment) and scheduling of appointments (like e.g. tasks, time and location).
- Mobile office applications such word processing, spreadsheet, presentation software and personal information software while being on the move [34].

These mobile work support functionalities provide a comprehensive framework for examining the perceived fit of pharmaceutical sales-force worker task characteristics with MCT.

RESEARCH MODEL AND QUESTIONS

Zheng's research [34] is based on contingency theory and Task Technology Fit (TTF) research and uses the construct of perceived usefulness to measure the fit between tasks and MCT [34] and argues that 'task-technology fit and perceived usefulness are the same constructs' which is supported by other researchers [27], [8]. Building on previous research in this area (i.e. [12],[18],[34]), we will use the "predicted outcome" approach to gain a better understanding of the perceived usefulness of a technological innovation (use of mobile computing technologies in the field by sales-force workers) that is not in place yet in an pharmaceutical company.

For this research, the TTF model has been adapted to the context of use of MCT (technological innovation – this implies that MCT will result in change in product and process) and the sub set of six mobile work support functionalities [34] and pharmaceutical sales-force worker tasks. In particular in this first research phase reported on this paper, we wanted to determine how well each of the mobile support functionalities fit with pharmaceutical sales-force worker task characteristics by interviewing a cross section of sales-force workers. Drawing on previous work of [34] in other words how useful each of the six mobile support functionalities are perceived to be by pharmaceutical sales-force workers indicates the degree of fit with their mobile work tasks. Furthermore is the perceived usefulness of mobile work support functionalities influenced by individual characteristics of mobile sales force workers and does the perceived usefulness of mobile work support functionalities also imply innovativeness.

The first phase of this research aimed to determine if mobile tasks of pharmaceutical sales-force workers are a perceived good fit with use of MCT, and whether a high level of perceived usefulness also implies a high level of innovativeness. Hence in this phase of the study following research questions were investigated:

Q1 Do sales-force workers perceive mobile support

functionalities to be useful in their mobile work?

Q2 Does the perceived usefulness of mobile work support functionalities also imply a degree of innovativeness in the way sales-force workers conduct their tasks?

METHODOLOGY

A case study research design is appropriate as this research fulfills all three conditions as proposed by Yin [32], namely descriptive in nature, the researcher has little control to influence the overall research project's dependent variables and independent variables and the analysis of perceived usefulness of mobile support functionalities and their degree of innovativeness across a range of pharmaceutical sales-force workers is a contemporary event. Data was collected through a series of in-depth semi-structured interviews in one case organization, the German division of a global pharmaceutical company. The interview protocol and specific questions used for the semi-structured interviews were framed within the context of Zheng's six mobile work support functionalities [34].

We collected both qualitative and quantitative data from each interviewee to gain a deeper understanding of what and how each specific mobile support functionality was perceived to be useful and possibly innovative in conducting mobile sales-force worker tasks. The semi-structured interviews allowed us to collect a rich set of data about the perceived usefulness of mobile work support functionalities in the context of pharmaceutical sales-force workers. The strengths of both qualitative and quantitative data complement each other in establishing a better understanding of a real world phenomenon [10].

Twenty sales-force workers in the case organization were interviewed. A cross-section of sales-force workers with different levels of (work) experiences, employee status, tenure and gender were purposively selected for the interviews to gain a variety and range of viewpoints across the sales-force worker group regarding the proposed use of mobile computing in their field work. In order to achieve triangulation and to capture a diverse set of viewpoints from across the sales-force workers, two different categories of sales-force workers (4 sales-force workers, 1 supervisor) from four different pharmaceutical business units are interviewed. The interviews took 30 to 60 minutes, were tape recorded in German, and translated and transcribed in English. Qualitative data analysis software Weft QDA was used to support and manage the data analysis process in a rigorous and verifiable manner.

Results of data analysis

A good cross-section of operational and managerial employees, gender, and tenure were represented in the 20 interviews conducted in this study. This is in contrast to many previous studies of mobile computing which have only represented one viewpoint and often very little representation of female gender. With respect to the research project's non-disclosure agreements, the names of the case organization's business units have been intentionally disguised.

The following Tables presents a summary of the main findings regarding the perceptions of the 20 interviewees in relation to each of six mobile support functionalities as to whether these are considered to useful and their degree of innovativeness in conducting their tasks in the field.

Mobile Communication

	Already used		Perceived usefulness	Degree of innovativeness
	Yes	No		
Mobile communication				
1. Reading/writing Emails	13	7	High	High
2. Opening email attachments	11	9	High	High
3. Unified messaging	3	17	Low	Low
4. Reading/writing SMS	18	2	High	Medium
5. Instant messaging/chat	7	13	Low	Low
6. Video telephony	6	14	Low	Low
7. Participating in web conferences / web casts	7	13	Low	Medium

Table 1. Mobile Communication ratings

While email handling in the mobile work setting is considered to be highly useful and innovative by the interview informants, Table 1 shows that almost no support could be found for the usefulness or innovativeness of chatting, video telephony, web conferences or UMS in the mobile work setting of the interviewees. This indicates that these functions of mobile communications are not a good fit with sales-force workers tasks. Pharmaceutical sales-force workers have most likely been using the "reading/writing SMS" functionality for many years. However, it can be concluded that mobile email communication in general (reading/writing of emails and opening email attachments in the mobile work setting) does fit well with pharmaceutical sales-force worker tasks. The following interviewee quotation supports this assumption:

"Some emails cannot wait until the evening to be written. Waiting times can effectively be used for such purposes. With this increased flexibility, I can concentrate more effectively on my daily work." (P10)

Email handling is considered to be effective for both internal communication with colleagues and external communication with their customers - physicians. Several interviewees stated that customer satisfaction might be increased through prompt email responses to open questions raised by customers. Eighty-nine percent of German physicians use the internet at least once a day and 85% of them check their emails at least once a day [7], we can assume that email communication and information gathering via email is an integral part of their working life.

In addition, several interviewees noted that information exchange with colleagues (sales force and headquarter) via email might be improved through quicker response cycles. For example, marketing department wants collect information on a specific topic (e.g. on the performance of specific product; impact of a health care law on physician; the impact of specific sales method etc.) via email. With the help of mobile communication as a specific function of MCT, a sales-force worker could communicate more quickly and the internal department could respond sooner if necessary. Otherwise, the internal colleagues would have to wait until the evening for a response or would have to call the respective sales-force workers.

Another positive aspect not only specific to mobile email communication is the possibility to use dead times more effectively and efficiently. For example, some interviewees mentioned that email communication might also be helpful in dead times in order to communicate with internal support departments (e.g. HR, IT etc.) in order to handle administrative work in the mobile work setting.

Mobile information searching

Mobile information searching	Already used		Perceived usefulness	Degree of innovativeness
	Yes	No		
1. Online access to intranet	7	13	High	High
Online access to corporate databases	4	16	High	High
2. Online access to CRM system	5	15	High	High
3. Online access to ERP system	2	18	Medium	Medium
4. M-learning: accessing learning modules	0	20	Medium	Medium
4. Internet search	12	8	High	High
5. Accessing e-books with medical/product information	3	17	Medium	Medium
6. Accessing video, audio content (e.g. IPTV broadcast, online videos, podcasts etc.)	5	15	Low	Low

Table 2. Mobile information searching ratings

Table 2 shows that the online access to corporate systems (i.e. Intranet, CRM, ERP etc.) and the internet in the mobile work setting is considered to be highly useful and innovative by the sales-force workers. Practically no support could be found for the usefulness and innovativeness of video access, eBooks access, audio content or m-learning content in the mobile work setting of pharmaceutical sales force workers in this case organization.

The interviewees provided a number of reasons why mobile information searching functionalities have the potential to support pharmaceutical sales-force work in several ways. First, sales-force workers can prepare more effectively for ad hoc/unplanned sales calls as he/she can gather new information in real-time by accessing corporate databases and the internet in the mobile work setting. By having online access to customer-related data from the company's CRM system, a sales-force worker can look up basic data (address, opening hours, prescribing behavior, customer value/priority, turnover etc.) and the latest activities (last visits, last feedback, open issues from last call etc.) with regard to a specific customer. There is a need to support those ad hoc sales calls as during a usual working week, 10-20% of all sales calls are ad hoc calls as highlighted in following interviewee quotation:

"MCT is the appropriate tool in order to prepare for ad hoc sales calls." (P4)

Second, a sales-force worker might receive time-critical information during a usual working day that might be of value for upcoming sales calls. The following quotations from interviewees support this notion:

"A critical part of pharmaceutical sales-force work is to provide new information for the customer. If this is not the case, the sales call was a waste of time." (P1)

"Especially my business unit, current knowledge about our and competitor's products is crucial during the sales call. Mobile information searching could help solving knowledge

gaps during the working day. Reality is too complex in order to prepare for all unexpected events in advance." (P6)

Third, customer inquiries (like e.g. product-related questions or services offered by the respective company) that cannot be solved in advance might either be handled during the sales call by accessing online systems in presence of the customer or directly after the sales calls. In the next break, all necessary information can be collected and delivered by the sales-force worker to the customer, either by revisiting, calling or emailing. The customer might feel more valued and will receive the information requested more quickly. Current research on physician internet usage proves their increased information needs [7]. A well-prepared pharmaceutical sales-force worker can add value to the sales call by providing additional information collected through mobile information searching functionalities.

Based on the explanations provided by the interviewees, we can conclude that information delivery which can be effectively supported by MCT can be considered as a competitive differentiator for pharmaceutical sales-force workers.

Mobile transaction processing

	Already used		Perceived usefulness	Degree of innovativeness
	Y	N		
1. Entering data in online-systems instead of making paper-based notes	1	19	High	High
2. Supporting specific business processes on spot	1	19	Medium	Medium

Table 3 Mobile transaction processing rating

Table 3 shows that there is a strong support for the usefulness and innovativeness of mobile transaction processing functionality to capture business-relevant data in real-time instead of making paper-based notes and feeding the data into a system at the end of the working day. Only medium support could be found for the support of specific business processes in real time as currently there is no specific business process that could be supported online. In contrast to other mobile business models, pharmaceutical sales-force work in Germany is limited by German law as a sales-force worker is not allowed to directly sell products to a customer. They can promote products but cannot sell them.

Currently, sales-force workers make paper-based notes of their sales activities and all sales-/CRM-relevant data (call feedback, customer response, plans for next calls, customer network information etc.) is entered in appropriate systems at the end of a working day. Most of the interviewees welcome this mobile transaction processing functionality as evidenced in the following interviewee quotation:

"Great idea - double work will be significantly reduced!" (P17)

In addition, customer service can be increased as medical inquiries from a physician could be typed in an online system in front of the physician (or directly after a sales call). Sample management process would be facilitated as the system could check whether the respective customer is allowed to receive a

specific medical sample. (Medical samples of products are handed out in order that physicians have the chance to try out. Due to legal restrictions, sales-force workers are only allowed to hand over a specific amount of medical samples to a customer). The organization's specific event management process that is currently enhanced by a complex web application can be enriched by mobile functions. For example, data about customers participating in educational events sponsored by the case organization can directly be handled online via mobile transaction processing as a specific function of MCT.

Mobile transaction processing is considered as useful and innovative when the creation of paper-based notes can be eliminated and thereby data can be collected on-the-spot and online. Capturing/collecting CRM data directly after a sales call has taken place (like e.g. customer feedback, plans for next call, inquiry data, participation in company-sponsored events etc.) into an online system is considered as useful as this increases overall data quality (as data is still in the sales-force worker's short term memory), reduces the amount of paper-based notes and thereby increases a sales-force worker's overall efficiency as double work will be reduced.

Mobile job scheduling and dispatching

	Already used		Perceived usefulness	Degree of innovativeness
	Y	N		
Receiving sales call appointments arranged by a centrally coordinated unit	0	20	Low	Low
Assigning new mobile work tasks to colleagues automatically	0	20	Low	Low
Receiving new mobile work tasks from colleagues automatically	0	20	Low	Low

Table 4. Mobile job scheduling and dispatching ratings

Table 4 shows that no support could be found for the usefulness and innovativeness of any mobile job scheduling and dispatching functionality rated by interviewees. Interviewees emphasized that Pharmaceutical sales-force workers are used to working with a high degree of autonomy and do not like the idea that someone else tells them whom to visit. They make weekly plans to determine which customers they visit and they align these plans with colleagues and supervisors. They think that they know their customers best and no other colleague would be able to guide them better. The following interviewee quotations provide further support for this finding:

"In the field, we are 'lone wolves'. We do not need someone who tells us whom to visit/what to do. We know where our customers are located and if not, we have a navigation system to find it out." (P12)

"I know my customers best – why should someone else decide who I should visit?" (P2)

As there is a weekly planning process that is done in every business unit, ad hoc calls take place too seldom (10-20%) to justify automating this process. Furthermore, if a sales-force worker wants another sales-force worker to visit a certain

customer, a phone call is considered sufficient. Mobile job scheduling and dispatching functionalities add value in those businesses where we have a high criticality of tasks and customer relations are of low importance as it is the case in the utilities industry [1]. Given the specific nature of pharmaceutical sales-force work in Germany, we can conclude that mobile job scheduling and dispatching functionalities do not provide added value in the current business environment as there is no need to dynamically assign tasks to sales-force worker in their mobile work setting.

Location-related services

Location-related services	Already used		Perceived usefulness	Degree of innovativeness
	Y	N		
1. Receiving information about the location of colleagues or customers	2	18	Low	Low
2. Receiving information from navigation system regarding the current position and the distance to a specific location	20	0	High	High
3. Receiving additional information about the current location like hotels, gas stations, restaurants etc. that are within reach	20	0	High	Medium

Table 5. Location-related services ratings

Table 5 shows that similar to the mobile job dispatching and scheduling functionality, no support was found for the usefulness or innovativeness of the location-related services functionality.

In general, a number of interviewees were quite hostile regarding the location-related services functionality and asked the interviewer whether this functionality complies with German law and whether the workers council is involved in this project. It was noted that there was strong resistance to use the location-related services functionality. The following interview quotations underline this strong sentiment:

"Sounds like George Orwell in his novel '1984' - Big brother is watching you!" (P12)

"Abuse (by the employer) is certain." (P20)

"Do you want to spy on me?" (P9)

"Does the organization want to hand out electronic ankle manacles?" (P3)

Due to the high work autonomy of the pharmaceutical sales-force workers, there is no specific business need to know the location of another working colleague. Again, a phone call is considered sufficient in order to find out the location of a colleague. While this functionality might be useful in other industries with different business models [1],[16], we can conclude that location-related service functionalities do not fit with pharmaceutical sales-force work.

In addition, the usefulness of both navigation system functionalities is not considered in further discussions as it is already installed in all of the sales-force workers' company vehicles.

Similar to mobile job scheduling and dispatching functionalities, location-related services are not considered to be useful and innovative by the interviewees. Moreover, some

sales-force workers interviewed showed a strong resistance to using these functionalities as they fear that their autonomous way of work could be changed (through mobile job scheduling) and they feared that their employer might misuse the tool for unnecessary controlling purposes (location-related services).

Mobile Office

Mobile office	Already used		Perceived usefulness	Degree of innovativeness
	Y	N		
1.Outlook: Accessing online calendar, arranging appointments	12	8	High	Medium
2. Excel: Using calculating software while on the move	9	11	Medium	Medium
3. PowerPoint: Reading, editing and creating presentations	4	16	Medium	Medium
Holding presentations in front of the customer	2	8	Low	Medium
4. Accessing and editing online task lists	6	14	Medium	Medium
5. Using mobile device as dictation machine	4	16	Low	Low
6. Accessing and manipulating documents which are stored online	7	13	Medium	Medium

Table 6. Mobile Office ratings

Table 6 shows that no support could be found for the usefulness or innovativeness of mobile device as dictation machine. Some limited support could be found for the usefulness and innovativeness of modification/collaboration of MS office documents in the mobile work setting. The following interviewee quotations underline this assumption:

“Please fill my dead time with life.” (P13)

“Day-to-day work can be done during the day in dead times – and not in the evening hours.” (P3)

According to the interviewees, there are several scenarios for mobile office functionalities which add value to their tasks conducted in the field. First, office-related work that is normally handled in the home office after a usual working day could now be handled in the dead times of a sales person’s mobile work setting. In addition, all additional data collected where no corporate system is available can be captured via mobile office functionality like e.g. Excel. Third, tasks entered in an online task list do not need to be noted on a piece of paper. Fourth, some interviewees already take their laptop with them and use mobile office functionalities, but offline. Online access would provide additional value for them.

“Accessing mobile office functionalities in my dead time (like e.g. after lunch break) would be helpful as I would not have to do all administrative tasks (like e.g. expense reports etc.) late at night in my home office. Headquarter colleagues could receive the information they requested more quickly.” (P13)

“Mobile office can help me to accomplish tasks in dead times of my mobile work environment that I would have to otherwise at home. Great!” (P18)

For an effective use of mobile office functionality, a clarification is necessary on how it will be technically provided – thus via laptop/netbook with UMTS card or a Smartphone application? In addition, a general decision needs

to be made whether the case organization wants their employees to hold presentations via Laptop during a sales call.

Most mobile office functionalities are considered to have a medium level of usefulness/innovativeness, especially using Microsoft Office products in dead times like waiting times or meal breaks. The interviews also revealed that mobile office functionalities are more useful for supervisors than operational sales-force workers, as they have more contact with headquarter colleagues, make fewer sales calls and have more administrative and reporting responsibility.

DISCUSSION OF DATA ANALYSIS RESULTS

Q1. Do sales-force workers perceive mobile work support functionalities to be useful in their mobile work?

Certain sub functionalities of mobile email communication, mobile information searching, mobile transaction processing and mobile office fit well with pharmaceutical sales-force worker tasks. However the interviews revealed that mobile job scheduling and dispatching and location-related services functionalities are not considered useful or innovative by sales force workers. The following table summarizes the top five specific mobile work support functionalitie that are considered by the interviewees to be a good fit (useful and possibly innovative) with sales-force worker tasks.

Mobile work support functionalities	
1	Mobile email communication (Reading/writing emails & opening attachments)
2	Online access to CRM system and other information resources
3	Entering sales-process related data on the spot in the appropriate online system
4	Internet search
5	Mobile office functions

Table 7: Top five specific mobile work support functionalities that fit well with sales force work tasks

This research also identified that specific mobile work support functionalities such as location-related services and mobile job scheduling and dispatching of work are likely to be strongly resisted by sales-force workers.

Q2. Does the perceived usefulness of mobile work support functionalities also imply a degree of innovativeness in the way sales-force workers conduct their tasks?

While the interview data indicated a relationship between perceived usefulness of mobile work support functionalities and the degree of innovativeness, it was also apparent that many of interviewees felt that usefulness and innovativeness were difficult to separate as constructs. As one interviewee puts it:

“In my humble opinion, your differentiation between usefulness and innovativeness is only of academic nature.” (P16)

CONCLUSIONS AND IMPLICATIONS

The real potential of MCT can be exploited when using [34] mobile work support functionalities in combination. For example, if you combine two or mobile work support functionalities, (like e.g. looking information up and the communication via email), the real usefulness and

innovativeness of MCT is revealed. Thus, there are synergies among those functionalities. All in all, we can conclude that the use of mobile work support functionalities does not stand for a radical change in the way pharmaceutical sales-force work is done in Germany. Our findings indicate that the degree of change can be considered as incremental change as the innovative use of mobile work support functionalities can be considered as an enabler that has the potential make every sales-force worker more effective and thereby to make the company as a whole more effective.

This research provided rich insights in how mobile work support functionalities fit with sales force worker tasks in the field in a large pharmaceutical company. Mobile work support functionalities framework was used to establish with sales-force workers which specific mobile work support functionalities are perceived to be useful and a good fit with sales force work tasks. We also sought to establish which mobile support functionalities were also considered to be innovative.

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INFORMATION TECHNOLOGY BASED COMPETENCIES FOR PROFESSIONAL ACCOUNTANTS IN MALAYSIAN SMALL MEDIUM SIZED ENTERPRISES (SMEs)

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ABSTRACT

Nowadays, professional accountants have to deal with a range of information technologies in a variety of ways throughout their professional lives. An all emphasising skills based competency for accountants is, therefore, required, which not only caters for technical skills, but also requires organisational, human, and conceptual skills to take optimum advantage of IT for the benefit of the entire organisation. This research seeks to investigate IT competencies among professional accountants in Malaysian SMEs. This study takes a comprehensive view of IT competence for professional accountants, and investigates the issue at hand in technical, organisational, human, and conceptual dimensions. In doing so, it employs a qualitative interpretive research methodology with exploratory case study method. It uses diverse data collection strategies including, and relies on triangulation of evidence to resolve the research questions in this study. This research, thus, makes significant contribution to academic and professional bodies and provide theoretical base for developing IT related competencies for knowledge workers in general and professional accountants in particular.

Keywords: information technology, competencies, technical skills, organisational skills, people skill, conceptual skills, professional accountants.

INTRODUCTION

Information technologies (IT) have changed the way businesses are organised as well as the way they executed [42]. IT has become an integral part of routine business, as these technologies assist employees to not only execute business processes but also helps them in making informed decision based on quality information. The International Federation of Accountants (IFAC) [20], states that IT is pervasive in the business world and ascertain level of competence is imperative for professional accountants to perform their tasks. The traditional role of accountants has been transformed from manual to computerised accounting [24] and IT is increasingly being embedded in accounting tasks,

for example management reporting [41]. In fact, IT has transformed the way data is collected, processed, stored, and aggregated for preparation for accounting and finance related information required by the management to control and manage the business activities.

IT competencies are imperative for accountants to perform their tasks [40]. These competencies constitute IT skills, IT experience, management skills (in particular project management) and interpersonal skills. These skills on one hand aid the routine business activities related to an accountants' work, and on the other hand help them create an environment where these technologies operate at their optimum level for the strategic internal and external advantage of the business. This also signifies the changing phase of accounting work and corresponding IT skills. For example IT has reduced the massive amount of work involved in double entry systems and maintenance of various ledgers; and the same time the role of accountant has changed from simply bookkeeping to a decision maker [36].

Recent trends indicate that business organisations have become customer oriented, information driven, project based, flatter in structure, and consisting of a number of functional and cross functional teams [4]. An all emphasising skills set for accountants is, therefore, required, which not only caters for IT skills but also accounts for organisational, human, and interpersonal skills. Such a skills set equips individuals with the requisite skills and knowledge to produce quality outcomes for the benefit of the entire organisation.

Therefore, there is a complex set of competencies required by accountants to offer better quality service to customers. Knowledge of IT and experience in IT, of course, is at the core of these skills. However, there are certain organisations, human and interpersonal skills required by the accountants to make appropriate use of IT skills in organisational settings. For example, for an accountant, skills and competencies in use of spread sheet or taxation software or accounting software is required. However, these softwares are process dependent and take input from various other areas of

the organisations and at the same time provide output to various other areas of the organisations. In these circumstances, an individual needs to have complementary teamwork, interpersonal, and analytical skills to understand the information needs of the process, comprehend process hand offs and interfaces, and process information to produce useful outputs.

There are several studies have been conducted to analyse the views of accountants with regards to IT competencies. Chang and Hwang [9], for example, questioned whether accountants are competent in the use of IT and have voiced concerns over whether college education and personal training effectively and efficiently prepare accountants to meet these challenges. Similarly, Mgaya and Kitindi [26] argue that the widespread use of IT has forced accountants to become more competent in the use of IT in order to survive in their profession. This issue has also concerned Greenstein-Prosch and McKee [15] who conducted a study on this issue looking at accounting educators and audit practitioners. Their results indicate that accountants possess a low level of knowledge of critical business technologies, such as wireless communications, software security tools, network configurations, and workflow technology. In addition, Rai, Vatanasakdakul & Aoun [32] support the findings of Greenstein-Prosch and McKee [15] in a study conducted in Australia which revealed that the overall IT knowledge levels among Australian accountants are lower than the perception towards the importance of these technologies [32].

Currently, IT competencies for professional accountants, particularly in Malaysian SMEs context is an area that has not been fully explored. Although many studies have been conducted in Malaysian context focusing on the identification and analysis of technical skills and knowledge of accounting students, accounting practitioners such as auditors, and to analyse the integration of IT into accounting curriculums [22, 23, 37], yet, there have not been any study into the nature and type of IT related skills required for professional accountants to perform their duties efficiently. Even in the studies where IT skills were investigated, those skills were investigated in a uni dimensional manner. This means that only the skills related to the use of IT skills has been investigated.

It is essential to explore the skills set required by professional accountants in Malaysia to perform the tasks efficiently. Malaysian context is particularly different because SMEs in Malaysia rely on government assistance and incentives to accelerate the use of IT [35, 18]. It will, however, be interesting to study the competencies develop the use of IT in different culture settings.

LITERATURE REVIEW

Boritz and Carnaghan [5] posit that competency is the ability to 'do' rather than the 'know how' to do an activity. The authors further assert that knowledge on its own is not sufficient to represent competence. This statement is supported by Palmer [29] who argues that competence is outcome-based in terms of the ability to perform professional responsibilities including knowledge and skills. IFAC [21] defines competencies as the ability to perform professional tasks and roles expected of an accountant, whether fresh graduate or experienced, to the standard expected by employers and the general public.

Oxford Dictionary [28] defines competence as the state of quality of being adequately or well qualified or a specific range of skills, knowledge and abilities. Competence, therefore, is the link between skills of employee and the job requirements. Basselier, Reich & Benbasat [3] define IT competencies as the set of IT-related knowledge and experience that a business manager knowledge worker possesses. The authors suggest two dimensions; IT related knowledge and IT experience. IT knowledge refers to specialised knowledge possessed by individuals i.e., how well they understand fundamental IT concepts, how well informed they are about the use of IT in their organisation. IT experience, however, is referring to the activities taking place in the particular organisational context relating the individual's work. IT experience represents the technical knowledge of the individual that he/she has gain from previous interaction with technology. So that, increased interaction has resulted in an increased the competency level of the individual.

In the accounting context, Carnaghan [8] views IT competencies as what would be demonstrated by activities, like being able to create a spread sheet or database for a particular purpose, or the ability to use software. Table 1 illustrates a compilation of IT competencies definition from various authors. According to IFAC [21], professional accountants are expected to possess necessary IT competencies and the credibility of the accountancy profession depends on their success in fulfilling this obligation. Thus, every professional accountant is expected to act as a user, designer, manager, planner or evaluator of information systems; or a combination of these roles [40]. It has to be acknowledged that these roles require technical skills, organisation skills, interpersonal skills, and other social skills. In contemporary context, interpersonal skills are extremely important as these skills in an IT context are essential ingredient of the skill required to support the professional accountants [21].

Table 1: Definition of IT Competencies

Author(s)	Definition of IT Competencies
Gold, Malhotra & Segard [14]	<i>"the shared IT capability that enables the flow of knowledge in organization to be supported"</i>
Tippin & Sohi [39]	<i>"consist of three important component, namely IT knowledge, IT operation, and IT object"</i>
Basselier, Reich & Benbasat et al. [3]	<i>"the set of IT-related knowledge and experience that a business manager possesses"</i>
Carnaghan [8]	<i>"what would be demonstrated by activities, like being able to create a spread sheet or database for a particular purpose, or the ability to use tax planning software"</i>
Croteau & Raymond [10]	<i>"to support the effective use and management of IT"</i>

Source: Compiled from various authors

In considering the definition for IT competencies of professional accountants, it is important to emphasise the need for both IT skills and relevant knowledge such as management skills, interpersonal skills and experience of IT [21]. Thus, integrating the abovementioned definitions and discussion, IT competencies are defined as;

"the set of IT skills, management skills, IT experience and interpersonal skills that professional accountants must possess to use IT effectively".

IT Competencies for Professional Accountants in Malaysian Paradigm

In Malaysia, IFAC guidelines have been used by accounting educators and accounting practitioners as a guide to improve professionalism of accountants. Although professional accountants' IT competencies are required by the professional standards set by IFAC, very little is known about professional accountants IT competencies levels, especially in developing economies such as Malaysia [22]. There are very few studies available that have investigated IT competencies for professional accountants in developing economies. These studies, however only

use one dimension that is i.e. IT skills to measure accounting practitioners' competence in using IT. Ismail and Abidin's study found a relatively low level use of technology by participants, especially in advanced technologies such as EDI, CASE tools, agent technologies, database design and application service provider, even though these technologies are considered as important [22]. On the other hand, Lai and Nawawi [23] study reveal that the usage of e-tax applications is still not pervasive in tax practice among accounting practitioners. However, the findings of these studies indicate that only a few technologies such as word-processor, electronic spread sheet, email, electronic search and retrieval and small accounting software are considered as adequate by the participants in the attempts to identify the critical IT skills among them.

In conclusion, both studies suggest that the participants may not yet understand the relevance of some technologies relating to accounting work. Moreover, these studies only focused on the accountant as an auditor and tax practitioner, thus, the scope of this study need to be extended to professional accountants in general. It makes this research highly appropriate to Malaysian context, because this research not only takes some multidimensional perspective but also looks as the IT competencies required for professional accounting in general.

What Constitutes IT Competencies for Professional Accountants?

IFAC through IEG 11 encourages professional accountants to have competencies in IT. However, the standard required of IT competencies is not specified and does not give a specific approach on how to develop the IT skills and competence. Therefore, the information systems literature has been reviewed to identify what dimensions or elements have been employed in previous studies. Most of the outcomes of these studies have been a list of IT skills such as the ability to use spread sheets, word processor, accounting packages and web browser that accountants must be proficient with [15, 26, and 23].

Information systems literature indicates that IT related competencies dependent upon a number of other dimensions or skills [8]. Modern or contemporary professional accountants are required to provide leadership and management support in addition to their routine jobs. It is therefore, essential that professional accountants must have requisite organisational, management, behavioural, and people skills. These skills provide necessary support to IT skills so that professional accountants can perform their jobs effectively. It is, however also important to note that experience of

accountants, the culture of organisations, and the formal training of accountants will always have significant influence on the level of competence in accountant possesses in operating, designing and using IT [3, 21,19].

The literature suggests four different set of skills that are required by a knowledge worker in the contemporary paradigm [1]. These skills are technical, organisational, people and conceptual or TOPC skills framework. Technical skills involved specialised knowledge about methods, processes, and techniques designed to carry out specialised activity. Organisational skills are skills enable employees or workers to plan and carry on activities effectively. People skills deal with human behaviour and interpersonal process and conceptual skills include analytical ability, creativity, efficiency in problem solving and ability to recognise opportunities and potential problems.

Professional accountants' skills for success are highly required to react quickly and effectively in organisations. Thus, to be an effective accountant, the right mix of skills has to be developed to sustain the implementation of TOPC skills framework. This TOPC framework (see Figure 1) support accountants in everything they do during the accounting processes such as, auditing, recording daily financial transactions, preparing financial statements and making decisions. For that reason, the American Institute of Certified Public Accountants (AICPA) through Core Competency Framework asserted the values of professional accountants as competitive by identifying key TOPC framework elements such as communication and leadership skills, negotiation, strategic, problem solving and critical thinking and personal improvement as well as project management cited by Institute of Management Accountants [1]. In fact, good TOPC framework is critical to the prosperity and even the survival of organisations [1]

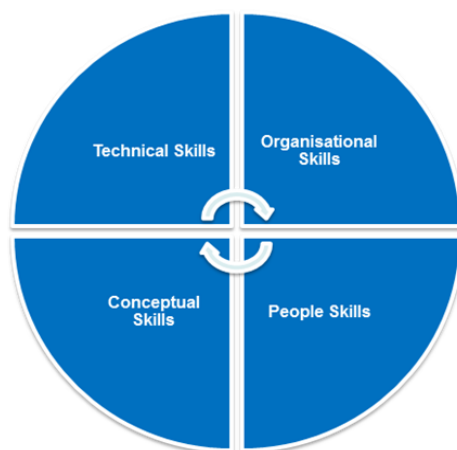


Figure 1: The TOPC Framework
Source: Developed by the Author

Technical skills

The rate of automation in contemporary businesses requires that knowledge workers possess a variety of technical skills. El-Sabaa [12] and Peterson & Van-Fleet [31] define technical skills as the one which provide an individual with understanding of specific knowledge, particularly involving methods, processes, procedures, or techniques to perform specific tasks. Specialised knowledge, analytical ability and the ability to use tools and techniques relating to the specific discipline are important indicators of developing technical skills [12, 30].

Technical skills, however, are extremely important for entry-level employees and fresh accounting graduates. El-Sabaa [12] denotes that the need for technical competencies decreases when an individual move to the higher level in an organisation. In fact, at the top of organisations' structure, the technical skills required a minimal.

In the accounting context, fresh graduates or junior accountants are required for performing such jobs like bookkeeping, maintaining financial management, and generating of taxation statement. However, when the chief of financial officer (CFO) of organisation is more concerned about decision making, management and control of organisation is not directly involved with the preparation of accounting reports and financial statements. The point being highlighted here is that the level of competencies changes as an individual progress in his or her career.

In response to changes in technology and the way businesses have been transformed, universities and other institutions imparting formal educations in accounting are also changing their curriculum to match these changes and equip their graduates to perform their tasks effectively [17, 37].

Byrd and Turner [6] argue that IT related technical skills should be related to programming, use of software packages, model building, model applications, data management, database development and data communication areas. In another study, Byrd and Turner [7] conclude that technical skills are the most important skill set in establishing information systems infrastructure, it used and maintenance. The authors emphasise technical skills such as programming languages, expert systems, decision support systems, managing a life cycle of projects, distributed processing, network management, maintenance, and developing web-based applications, CASE methods or tools and data warehousing, mining, or data marts.

IT Skills

IT skills are the ability of individual to use information technologies and tools such as Microsoft Office, databases and Electronic Resource Planning (ERP), electronic network and the other software and hardware used in execution of IT the business. IT skills are important for professional accountants since it enables them to use information effectively and efficiently [15, 26, and 40]. The following section listed some of the most commonly used software in Malaysian paradigm.

- Word processer software
- Spread sheet software
- Business accounting software
- Communication software
- Electronic search and retrieval
- Tax return preparation software

Organisational skills

Organisational skills are the skills which help employees to make their organisation better and successful [2]. These skills are defined as skills for organisations' smooth running processes, including intra-organisation, communication and incentives for employees to actively contribute to job efficiency [33]. In the accounting context, organisational skills assist accountants in organising and classifying accounting transactions into logical form, organising accounting work space, preparing financial budget, time management and prioritising certain accounting activities. Similarly, organisational skills are essential for successful accountants who need to balance a host of different duties. Several studies have identified time management and project management as organisational critical skills (See Table 2) [1, 25, 13, and 2].

Table 2: Organisational Critical Skills

Organisational Skills	
▪ Time Management	▪ Project Management

Source: Developed from various authors

People Skills

People skills can be described as human understanding of themselves, talking effectively, relationship of trust, respect and productive interactions [34]. In other words, these skills reflect the ability of employees to interact with stakeholders or clients in ways that develop respect, mutual understanding and productive working relations. Leadership, delegation, communication skills, teambuilding abilities, negotiation, teamwork, motivation and collaboration skills are the examples of people skills. People skills are necessary in accounting practices to communicate and negotiate effectively, not only to clients but also the stakeholders to gain a proper view of the information and business performance.

Conceptual Skills

Conceptual skills are the skills to analyse and diagnose a problem. These skills are skills that utilise the ability of a human to form concepts, such skills include creative thinking, abstractions, analysing complex situations, and problem solving [27]. These skills help a person to form concept about phenomena. Conceptual skills in the accounting context are imperative in analysing complex situations, processes and interpreting information for decision making [21]. Conceptual skills also include analysing complex systems, logical thinking, structured thinking, strategic thinking, system thinking, effective execution thinking, analytic skills and decision making.

Table 3: The Basic Skills Employees Need

People Skills	Conceptual Skills
<ul style="list-style-type: none"> ▪ Motivational Goal Setting ▪ Negotiation ▪ Teamwork ▪ Communication Skills ▪ Collaboration Abilities ▪ Delegation ▪ Leadership ▪ Teambuilding Abilities 	<ul style="list-style-type: none"> ▪ Abstraction ▪ Problem Solving ▪ Creative Thinking ▪ Analyzing Complex Systems ▪ Logical ▪ Strategic Thinking ▪ Effective Execution ▪ Thinking and Analytic Skills ▪ Decision Making ▪ System Thinking

Source: Aldag & Kuzuhara [1]

PROPOSED RESEARCH FRAMEWORK

This research seeks to investigate IT competencies among professional accountants in Malaysian small to medium sized enterprises. This study takes a comprehensive view of IT competence for professional accountants, and investigates the issue at hand in technical, organisational, human, and conceptual dimensions.

The main research question is “*How competent professional accountants working in Malaysian SMEs are in terms of using IT?*” followed by three sub-questions:

- What are the necessary IT skills set required for professional accountants?
- What are the IT related competencies that help professional accountants to perform their job better?
- What is an appropriate framework for developing IT related competencies for professional accountants in Malaysian SMEs?

The research framework illustrated in figure 2 shows foundation for this research which demonstrated the multi-layered and multi-tied framework of IT related competencies for professional accountants.

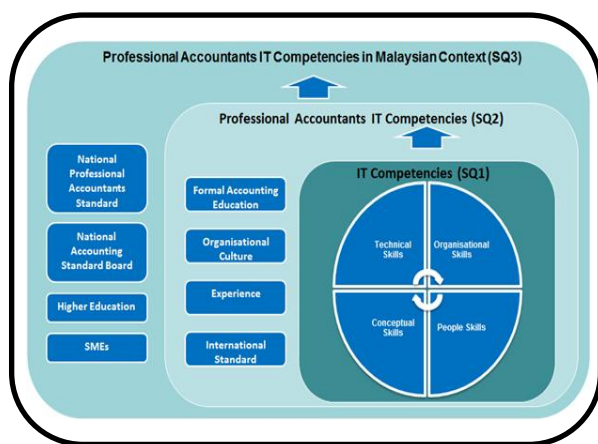


Figure 2: Conceptual Framework of the Research

Source: Developed for this research

The inner layer of the framework represents the first sub-question of the research which deals with the generic skill set of IT competencies. It takes a comprehensive view of IT competence for professional accountants, and investigates the issue at hand in technical, organisational, people, and conceptual dimensions. The second layer of the framework seeks to the IT related competencies that help professional accountants to perform their job properly. The aim is to employ the abovementioned

skill set in the perspective of experience, organisational culture, formal accounting education and the international standard for accounting practices. The third layer of the framework recognises the actual competencies of professional accountants in using IT for jurisdiction specific. For the purpose of this research, it will be focused to Malaysian jurisdiction specifically within Malaysian SMEs.

In order to answer the research question, this research will employ a qualitative interpretive research methodology with exploratory case study method. Qualitative research methodology approach is represented by distinctive techniques and tools [38]. It involves non-numeric data to provide a deeper understanding of phenomena within its context and creates a strong relationship between the phenomena under study and the researcher [16].

This research fits into the qualitative research genre because it focuses on individual interpretations and lived experience as described by Daly *et al.* [11]. In addition, the employment of this methodological approach enables a study of professional accountants IT competencies experiences and case study methodology is the best approach to answer the research question posed in this study.

CONCLUSION

This paper discussed issues about investigating of IT related competencies among professional accountants within Malaysian SMEs. The investigation is based on the integration of IT in every aspect of accounting works and the needs of professional accountants to acquire appropriate competencies to stay relevant in their careers. In addition, increasing professional accountants' IT competencies will help organisation to facilitate the full utilisation of IT infrastructure and generate efficiency in business activities.

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ISSUES IN ELECTRONIC CASE MANAGEMENT IN MALAYSIAN COURTS

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ABSTRACT

In Malaysia, the Civil and Shariah judiciary systems stand side by side for more than 50 years, adhering to their own different jurisdictions. Today, both courts move forward tremendously with the introduction of electronic case management systems. The Civil Court's E-Judiciary project consists of four different systems that cover the whole court processes from filing of cases through hearing to case disposal. On the other side, Shariah Court's E-Shariah project incorporates all the processes in one comprehensive system application. At the implementation stage, both courts faced with different legal issues and challenges, and dealt with them their own way. This paper traces the development, implementation and legal issues faced in both Civil and Shariah judiciary systems in Malaysia in the course of introducing electronic case management systems

Keywords: technology application, court management, court records management, e-government

INTRODUCTION

Before English occupation in Malaysia in the 18th Century, Shariah law was in force by the Malay kings called "sultans". The courts were known as Qadhi courts and the judges, appointed by the Sultans, were called Qadhi. All cases of civil and criminal nature were heard in the Qadhi courts. The British role in Malaysia started in 1786, however they only played a more formal and direct part in the administration in 1824, among others, introducing the Civil Law system, based on English Common law and statutes of England. But to respect the Malay rulers, the Qadhi courts are still maintained, with its jurisdiction restricted to only Muslim personal law and family matters. All other cases are governed by English Law, Civil and Criminal. Being an English subject, all people in Malaysia at that time is subjected to Law enforced in England. When Malaysia obtained its independence, the legal system is maintained until today.

Under such legal system, The Malaysian Federal Constitution clearly defined the separation of power between the Federal and state government. Under Schedule 9, List 1, the constitution

provides all matters of civil and criminal law and legal administration fall under the Federal's list, whereas List 2 of the same schedule listed Shariah or Islamic law matters is vested to state governments. As a result, Civil court and Shariah court becomes a separate independent entity with their own specific jurisdiction as provided by Article 121(1A) of the constitution.

Today, both Civil and Shariah Malaysian judiciary system administration have moved forward tremendously especially for the past few years. The introduction of E-Judiciary in the civil court and E-Shariah in the Shariah courts accelerates the case management processes, that was used to be slow and time consuming. This paper attempts to examine the practical aspects and legal issues for the management of electronic court records, both in Civil and Shariah judicial systems.

LITERATURE REVIEW

A reliable and accurate case file system is fundamental to the effectiveness of day-to-day court operations and fairness of judicial decisions. Effective records management system guarantees the accountability and integrity of an organisation that provides services to the public at large and serves as strategic resource for government administration [8]. The maintenance of case records directly affects the timeliness and integrity of case processing.

Gouanou & Marsh [3] alleged that in order to minimize the risks and costs of regulatory and legal non-compliance, litigation, discovery, business inefficiency and failure, organizations need to remove the human element by automating records management via the technology. The major issues in implementing electronic records in organizations are regarding access, security and interoperability [17] [19]. Interoperability refers to is the ability of different IT systems and software applications to communicate to exchange data between them accurately, effectively and especially to use of the information that has been exchanged [1].

According to the Legal & Regulatory Compliance in Information Management (LRCIM) Forum [2] organizations of all kinds must take a holistic, proactive approach to managing their information assets. Achieving regulatory and legal compliance

has also rapidly become a technological problem. However, that means that failure to get it right is invariably more expensive, and can be disastrous.

Organizations today not only have to comply with regulations, but also have to maintain a balance between operational record keeping requirements, minimizing liability of storing private information, and customer privacy preferences [1]. International Records Management Trust revealed several key issues identified by legal and judicial record case studies are (1) the need to raise the status and priority of recordkeeping, (2) the need to allocate greater resources to supporting recordkeeping infrastructure, for example, storage facilities and equipment (for paper and electronic records), (3) the need to develop records management policies and standards, for example in relation to access to and long-term preservation of paper and electronic records, (4) the recognition that computerized case management systems have the capacity to improve case flow management and access to information, but the danger of regarding computerization as a means of solving all management, resource and information problems, (5) the need for an information strategy and business case, based on the requirements of all key stakeholders, before embarking on the computerization of case administration, (6) the value of pilot computerization projects to build confidence and capacity and (7) the importance of standardized formats and templates for common documents [11].

RESEARCH DESIGN

The research is conducted in the Malaysian Courts of Law namely the Civil Courts and Shariah Courts. The research aims to: (1) Explore the implementation of electronic court records management in Malaysian Courts, (2) Analyse the requirements, policies and procedures for managing electronic court records, and (3) Establish a framework and assessment criteria guideline for a legally complied electronic court records management system. The research main question is "How can ICTs allow for better management and legal compliance of court records in Malaysia". The sub-questions are firstly, How is electronic court records life cycle management implemented in Malaysia? Secondly, What are the requirements, policies and procedures in place for managing electronic court records in Malaysia? And Thirdly What is the appropriate framework for legally compliant court records management in Malaysia?

RESEARCH SIGNIFICANCE AND CONTRIBUTIONS

In Malaysia, the public sector is facing pressing challenges to provide efficient service delivery. In recent years, a number of legal and judicial issues and crisis in Malaysia has been brought to the attention of the public, especially by the mainstream newspapers. The issues are among others, the long delay of cases, the attitude of lawyers, the shortage of judges, the absence of written judgment by judges, which sometimes deny the right of appeal to the accused, or generally deny certain rights of the public at large. Moreover, the increase demands of the public need to be catered. Any shortcomings resulted from the poor management in public service delivery may lead to the question of integrity of public sector, as well as the issue of survival, respect and vigor as a nation.

This study is expected to offer favorable contributions to the body of knowledge for academics and practitioners. In its theoretical contribution, the study is expected to identify critical dimensions or factors in electronic court records management. Practically, the research is projected for the enhancement of overall quality of judiciary administration by increasing integrity, efficiency, effectiveness. For court's policy makers, this research can promote an improvement in the judicial corporate administration as well as building an excellent service and reputation of the judiciary.

RESEARCH METHODS

This research is undertaken through an exploratory case study. Qualitative and quantitative data were collected through interviews, surveys, observation and document review. The preliminary findings shows that the implementation of electronic records management system in both Civil and Shariah judiciary systems lead to a tremendous improvement to the case management, resulting to efficient service delivery to the public at large. The following section will discuss the preliminary findings of the case study. The interview questions consist of 21 semi structured questions, whilst the survey consists of 52 questions. The case study was carried out in Kuala Lumpur, Putrajaya and Selangor.

RESEARCH FRAMEWORK

The following preliminary research framework is designed in line with the research objectives and questions.

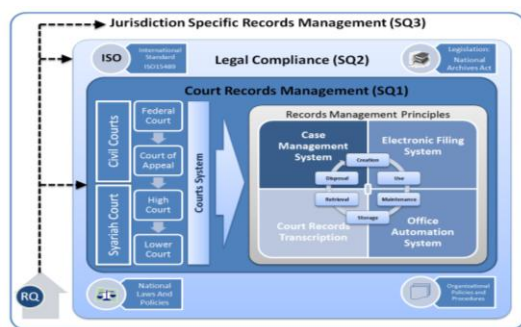


Figure 1: Research framework

DATA COLLECTION AND ANALYSIS

Research data was collected in a number of Malaysian courts in 5 location namely (1) Kuala Lumpur Court Complex consisting of Kuala Lumpur High Court, Sessions Court and Magistrate Court, (2) Palace of Justice in Putrajaya consisting of Federal Court, Court of Appeal and Chief Registrar's Office, (3) Kuala Lumpur Syariah Court Complex consisting of Syariah High Court and Lower Court, (4) Syariah Judiciary Department of Malaysia in Putrajaya, and (5) Legal Affairs Department in Putrajaya. The respondents are among others the Chief Registrar of Federal Court, the one who hold the apex position in civil court administration, a number of High Court judges, Chief Judge of Kuala Lumpur Syariah High Court, Deputy Registrars, Senior Assistant Registrars and ICT personnels. Data analysis was employed through triangulation of evidence from structured and semi structured Interviews, surveys, personal observation and document review. Data collected is analysed using analysis too including Nvivo & SPSS software.

PRELIMINARY FINDINGS

Tracing the history of E-Judiciary initiative in the Civil Court system, it was attempted once in year 2003 but failed. The reason being lacked solid support from the top management, resulting users reluctance to use the system. They did not give cooperation to in this project. Users are among others, prominent judges who are have been very comfortable with the existing conventional manual systems. In the second attempt, the situation it is totally different. The direction and vigour come from the apex position in the judiciary system, the Chief Justice. Judges are made compulsory by the Chief Justice to use the systems, which is an achievement.

To ensure the success of current project 4 level of committees were set up as follows:

1. Steering Committee, lead by the Director General of Legal Affairs Department. Committee members consist of Chief

Registrar of Federal Court, Director of Malaysian Administration and Modernisation Planning Unit, Director of Economic Planning Unit, The Director of Treasury Department, representative of Prime Minister's Department, National Audit Department and a representative of the vendor, FORMIS Sdn. Bhd. This committee is designated to formulate E-Judiciary policies. They also meet regularly once in two to three months, or as needed.

2. Monitoring Committee, consists of Legal Affairs Department, Malaysian Administration and Modernisation Planning Unit, IT department of Federal Court and FORMIS Sdn. Bhd. This committee is responsible for monitoring the overall implementation and development of E-Judiciary project.
 3. Technical Committee, with the task of controlling and coping with ICT problems. They meet weekly or fortnightly.
 4. User Committee, to tackle user problems
- E-judiciary project was established with the aims to: (1) allow on-line case filing to achieve paperless office, (2) save storage space and human resource, (3) allow immediate access to documents during trial, and (4) avoid document counterfeit. The four applications in the civil court electronic systems are: (1) Electronic Filing System (EFS), (2) Case Management System (CMS), (3) Queue Management System(QMS), and (4) Court Recording and Transcribing (CRT). The following illustration explains the overall view of how the systems interact with each other within the case management process:

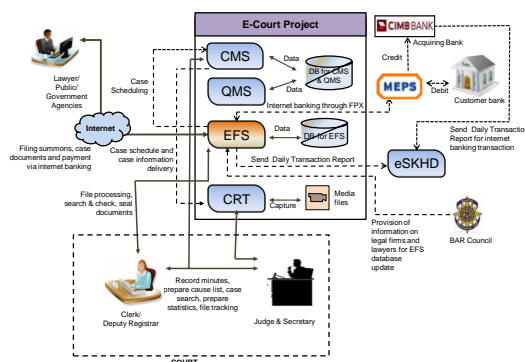


Figure 2:E-Court applications

In a typical standard operating procedure of a civil case, summons will be filed by a lawyer or individual or public through the online e-Filing

System. All the necessary documents are prepared in softcopy and submitted online(Figure 3). A payment of fees is done via internet banking. Once filed, the case will be managed under the case management system application. Queue management system is in operation when case is being heard or mentioned by the judicial officers (Figure 4). If the case needs to be heard by the judge, a trial date will be scheduled in case management system. In the courtroom, when trial proceeds, the court recording & transcribing system is in operation(Figure 5). This audio video recording system allows the proceeding to be recorded fully in audio video format, saved and can retrieved when needed, such as to make a report or case summary. For the purpose of CRT recording, every courtroom is equipped with 4 units of voice auto detect camera, each one facing to the judge, the witness, the plaintiff counsel and defendant counsel

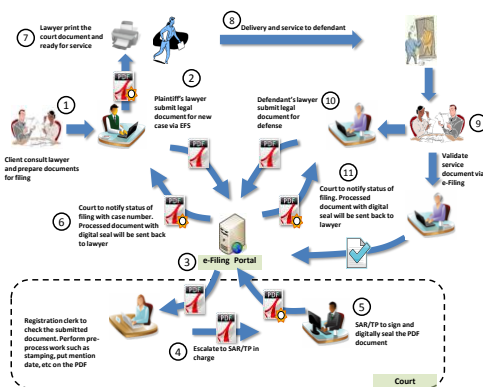


Figure 3:Process Workflow for e-Filing Application

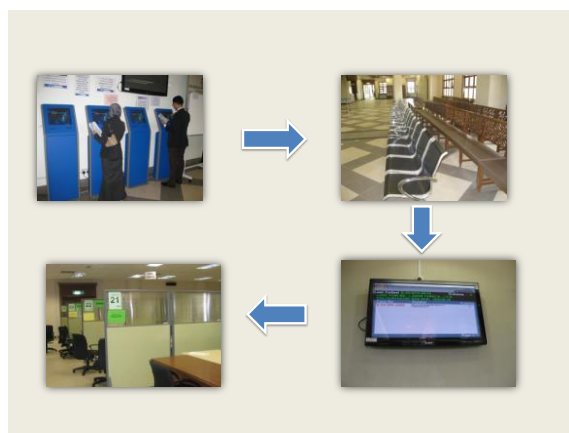


Figure 4: Queue Management System



Figure 5: Court Recording and Transcribing System

Malaysia implemented an audio video recording of its full trial proceeding, which is not been practiced in most other countries, including Singapore. This type of recording offers significant advantages, such as it allows experts to review the facial expression of the witnesses or the accused while they are giving their testimony. Since the recording is regarded as public document, lawyers can have a copy of the recording to bring back to their office. If there is any complaint or dissatisfaction on part of the lawyers, they cannot make such complaint anymore alleging misunderstanding occurred during the trial.

The implementation of e-Judiciary was pioneered by the Kuala Lumpur New Commercial Court (NCC). It was established on 1st September 2009 resulted from the court management review meeting headed by the Chief Justice of Malaysia. The objective is to ensure the increased number of commercial case disposals. A specific aim was put forward, i.e. new registered cases to be disposed within 9 months. Upon establishment, only two courtrooms were opened for trial, to test whether the aim can be achieved with the help of full running electronic systems in place. The two new courtrooms were named NCC1 and NCC2. The result are as follows:

Table 1: Case Registration & Disposal

Month	Sept 2009	Oct 2009	Nov 2009
Cases Registration	289	389	328
Case Disposal after 9 Months	285 (June 2010)	384 (July 2010)	324 (Aug 2010)
Balance of Case after 9 Months	4	5	4
Percentage of Disposal	98.6	98.7	98.7

It is evidenced that the aim to dispose new cases within 9 months from the date of registration, was achieved almost 100%. With this achievement, more courtrooms were opened subsequently. After one year of its establishment, by September 2010, the courtrooms were increased to 6 rooms with 6 high court judges, with 13 officers and 18 support staff. The registration of cases is now using „pairing system“. Case registration is rotated for every 4 months between the three pairs, NCC1 & 2, NCC3 & 4 and NCC5 & 6.

Under the Syariah Court administration, E-Shariah was developed to be used by all Shariah courts in Malaysia. E-Shariah is one of the seven pilot projects under the electronic Government application in Malaysia. The RM39 million project started July 2002 and completed by September 2005. E-Shariah is a web communication system connecting 102 Shariah courts in Malaysia incorporating various electronic services with the aim to increase efficiency and effectiveness of Shariah courts processes. E- Shariah, under the administration of Malaysian Shariah Judiciary Department, consists of five modules :

- Shariah Court Case Management System (SPKMS)
- Shariah Lawyers Management System
- Office Automation
- Library Management System
- E-Shariah Portal

E-Shariah was executed to replace the manual system of all Shariah courts operation. Before e-Shariah come into operation, all work processes from case registration to case disposal were performed manually. It resulted in inefficiency and ineptitude. With the increasing number of Shariah cases registered from time to time, the delay in case management becoming more critical. A single case takes months, even years to be settled, resulting hardship for the parties involved. With the introduction of e-Shariah, more cases are disposed timely, and case management is executed more efficiently and systematically.

Online services includes Civil case pre-registration, case status checking, Faraid calculation, forms download, Syarie lawyer search, Syarie lawyer information, Sulh service and Shariah legal references. Currently the systems is being updated from e- Shariah Version 1 to e-Shariah Version 2.

Shariah Court Case Management System was implemented since 2003 at all 123 Shariah courts in 102 locations in Malaysia. The successful implementation of SPKMS, alongside with other applications under the E-Shariah project is proven through the increased number of case disposal as well as few ICT excellent awards received.

After few years of its application, there were obvious improvements as shown in table 3.

Table 2: Pre & post E-Syariah Implementation

Dimensions	Pre-implementation	Post-implementation
Case management	Case management less efficient	Case management is very efficient, increase productivity and work vigour
Time	Registration and management of cases manually was time consuming, no one-stop service centre	Registration of new case take approximately 2 minutes, case management is efficient.
Case overlap	Case overlapping could not be easily traced manually	Case overlapping can be tracked easily
Statistics	Generating statistics manually was time consuming and difficult, sometimes erred, may lead to improper decision making	Statistics are generated promptly, facilitate excellent, unerring and timely decision making
Case post-ponement /delay	No automatic reminder about case postponement and delay	Automatic reminder of case postponement,
Work process	Work processes were not consistent between courts in different states	E-Shariah permits the uniformity of court procedures, work processes and forms.
Case backlog	Difficulty in managing, verifying and checking the case status manually leading to backlog cases	No more backlog cases because all cases are being taken care of and reminded of.
Customer friendliness	Different work process among states caused difficulty and bias to customers	Uniformed court procedures and work processes ensure fairness to customers
Information security	Information security was compromised	Information security is guaranteed

DISCUSSIONS

Storage space and disposal issues

The ever increasing high volume of case files in Malaysia contributes to delayed case disposal by courts. It also contributes to the storage space and disposal issues. The introduction of E-Judiciary system is perceived as a problem solver and very much welcomed. It gives a high impact to a country like Malaysia in terms of case disposal rate. In Kuala Lumpur Courts alone, an average of 1000 new civil cases are registered in one day. It also received about 50 000 traffic cases per month.

For storage of old records, Court has been spending a generous amount of money for storage of old records. This is due to the fact that nobody in the system can spare their time to think about what to do with old records. Most of the judicial officials are in the opinion that all case files must be kept permanently. A special instruction from the Prime Minister (Dr Mahathir) was in line with this belief. As a result, the size of storage space for case files is at par with the size of court rooms.

The turning point took place in 2009 with the intervention and involvement of National Archives of Malaysia (NAM). A series of workshops were held to reorganize recordkeeping system, and fundamental discussion was on how to deal with old records. Finally, the committee came out with an agreement signed by both court and NAM endorsing the Court Records Disposal Schedule which was developed during the workshops. After the endorsement, a large number of old case files were destroyed through series of „operation“ by the court staff out of office hours.

The provision of National Archives Act 2003 is enough to mandate the management and destruction of court records. We do not need any special act on court records management per se. All court records which has been considered as having permanent value such as cause books are being kept in Court Museum in Putrajaya. In fact, those high profile case files, such as Botak Chin's case should be preserved by NAM to ensure its lifespan. Those case files dated way back 1950s and 1960s have been kept in 2 buildings in Segambut. Building 1 costs \$15 000 per month and building 2 costs \$40 000 per month. Means \$55 000 is paid in 1 month or \$660 000 per year just to keep old normal files, not even having the historical value. All the old files kept are deserved to be destroyed. Special project was done this year to destroy them. When a file is to be

destroyed, the „order“ sheets are pulled out of the original file and be rearranged in a new „order“ file and be indexed. This collection of orders is kept permanently in the respective courts.

IT infrastructure

According to the Chief Registrar of the Federal Court, Chief Justice's determination to materialize E-Judiciary has been undeterred even the problem of unstable networking system is not fully solved in Malaysia. In line with this, the Head of IT Unit of Legal Affairs Department in Prime Minister's office, in charge of all IT matters for Malaysian e-Government project, claimed that network is a prevalent problem in the E-Judiciary implementation, especially for the old court building. A proper networks design is lacking in old buildings. A proper network design is integrated in all new buildings built by the Legal Affairs Department. Despite this problem, the E-Judiciary project is executed and any problem faced is tackled along the way. The IT Technical Committee comprising of is having a regular meeting every 2 weeks to report and solve any arising issues related to IT and networking as well as its legal compliance. For legal compliance, a number of laws and regulation need to be adhered to are:

1. Electronic Government Activities Act 2007 (Akta Aktiviti Kerajaan Elektronik 2007)
2. Public Sector Data Dictionary (Data Dictionary Sektor Awam)
3. ICT security Policy-MAMPU (Dasar Keselamatan ICT-MAMPU)
4. Biometric User Guidelines for Public Sector Agencies (Garis Panduan Penggunaan Biometrik Bagi Agensi Sektor Awam)
5. Information Technology Directive (Arahan Teknologi Maklumat)
6. Malaysian Public Sector ICT Security Management Guidelines (Garis Panduan Pengurusan Keselamatan ICT Sektor Awam Malaysia) (MyMIS)
7. Government ICT Security Policy Framework in General Circular No 3/2000 (Rangka Dasar Keselamatan Teknologi Maklumat dan Komunikasi Kerajaan -Pekeliling Am Bilangan 3 Tahun 2000)
8. The Malaysian Government Interoperability Framework for Open Source Software (My GIFOSS)

Human resource issues: the need for records manager

The Chief registrar of Federal Court admits that the lack of human resource in court is a serious problem. Efficient and speedy case disposal can be

achieved through the provision of specialized information professional in court system. The qualified records managers are in need in the court. In that view, the court is planning to set up a Records Unit to deal with matter related to court records. Addressing to the same issue, a senior High Court judge who has a vast experience in the judiciary system for more than 20 years and a prolific law books author, believed that the court should be given the full mandate to recruit its own staff. In Malaysia, the government have a common pool of civil servants. He alleged that for the position of support staff, court is being „dumped“ with those unwanted problematic staff from other departments, hence reducing courts efficiency. Furthermore, it takes time to retrain those people because they have no idea about the different nature of court's work, as distinct to other government department. He further argued that court should be let to stand alone, not be treated as one of ordinary public office.

With the proper records manager and other information professional placed in court, the legal professionals can focus on their legal/judicial duty, delivering justice within time. They will not be distracted with those administrative works as they have been doing so far. All administrative works could be performed professionally by those concerned such as information officers. With this job specification, court can play its role to deliver justice to the people within proper time frame.

Legal issues

Like other government agencies, courts are subject to all public department rules and regulations, including those pertaining records management such as the National Archives Act and the Security Act and Information Technology Security Act. In addition, the court has its own policies, rules and directives, usually issued by the office of Chief Registrar of the Federal Court (the apex court in Malaysian courts hierarchy). At its own level, the court issued, among others, Rules and Procedures in ICT and ICT strategic plan. Other related acts pertaining to electronic records are:

1. Electronic Government Activities Act 2007
2. Digital Signature Act
3. Computer Crimes Act
4. Copyright (amendment) Act 1997 (read also copyright Act 1987)
5. Personal Data protection Act/Bill

When the electronic case management systems was first in the Civil Court, it faced a challenging legal issues when one of the systems, the Court Recording and Transcribing (CRT) cannot be enforce in criminal cases because of the restriction set by the Criminal Procedure Code. Chapter

XXV of Malaysian Criminal Procedure Code (Act 593) provides for mode of taking and recording evidence in inquiries and trial of criminal cases. It consists of the following Sections and matters:

- Section 264 - Evidence to be taken in presence of accused
- Section 265 - Manner of recording evidence
- Section 266 - Recording evidence in summons cases
- Section 267 - Recording evidence in other cases
- Section 268 - Record to be in narrative form
- Section 269 - Reading over evidence and correction
- Section 270 - Interpretation of evidence to accused
- Section 271 - Remarks as to demeanour of witness
- Section 272 - Judge to take notes of evidence
- Section 272A - Other persons may be authorized to take down notes of evidence

The provisions clearly requires all notes of evidence in criminal cases be taken in the judges' handwriting, in narrative form.

For trial in Magistrate Court, Section 266 deals with mode of taking notes in summons cases and Section 267 deals with mode of recording evidence in other cases. Section 266 (1) provides "In summons cases tried before a Magistrate, the Magistrate shall, as the examination of each witness proceeds, make a note of the substance of what the witness deposes, and such note shall be written by the Magistrate with his own hand in legible handwriting and shall form part of the record". Section 267 provides "In all other trials before a Magistrate's Court, and in all inquiries..., the evidence of each witness shall be taken down in legible handwriting by the presiding Magistrate and shall form part of the record"

For High Court criminal case trial, The High Court Judge is required to take notes of evidence in handwriting by virtue of Section 272 of Criminal Procedure Code. It provides "In all criminal cases tried before the High Court the Judge shall take down in writing notes of the evidence adduced". Section 272A allows a judge, besides having his own notes, to instruct any other person to verbatim notes of what each witness deposes. This section does not mention any other modes of recording evidence in court. Hence, an audio or video recording is not legally acknowledged as to form part of the trial record.

This is the big hurdle for the implementation of Court Recording and Transcribing system when it is first introduced. It forced an amendment to be

made to the statute. Finally, the Criminal Procedure Code (Amendment) Act 2009 (Act A1350) was passed by the Parliament in April 2009, by inserting a new chapter i.e Chapter XXVA after Chapter XXV in the Criminal Procedure Code (Act 539). The new Chapter XXVA mandates the recording of proceedings by mechanical means. Section 272C explicitly permits any mechanical means be employed for the recording of any proceedings before all courts in Malaysia. It provides "Notwithstanding the provisions...dealing with the mode of taking and recording of evidence, any mechanical means may be employed for the recording of any proceedings...and where mechanical means are employed the provisions of this Chapter shall apply." Mechanical means is defined as any equipment, device, apparatus or medium operated digitally, electronically, magnetically or mechanically (272D(b)). Proceeding "proceedings" includes any trial, inquiry, appeal or revision, or any part of it, any application, judgment, decision, ruling, direction, address, submission and any other matter done or said by or before a Court, including matters relating to procedure (272D(c)). "electronic record" means any digitally, electronically, magnetically or mechanically produced records stored in any equipment, device, apparatus or medium or any other form of storage such as disc, tape, film, sound track, and includes a replication of such recording to a separate storage equipment, device, apparatus or medium or any other form of storage (272D(a)).

Section 272E further explained that proceedings may be recorded by mechanical means or combination of mechanical means and other method. The rest of the provisions in this new act deals with the transcription of electronic records (272F), safe custody of electronic record and transcript (272G), transcript to form part of record or notes of proceedings or evidence (272I), electronic filing, lodgement, submission and transmission of document (272J) and issuance of practice direction of court relating to the use of mechanical means and any matter related to it (272K).

So now, the legal issue regarding the authenticity of electronic records in criminal court is resolved. For civil cases, the Civil procedure Code does not explicitly require or prohibit any mode of note. For the Shariah Court system, the legal issues arise when Islamic matters were placed under states' jurisdiction by virtue of Schedule A of the Federal Constitution. It means the Shariah laws are enforced according to 14 different statutes in Malaysia. As an effort to standardize and manage

all the courts, a special department was established under the Prime Minister's Department, named as Shariah judiciary Department of Malaysia in year 1998. This department faced a struggle in bringing together all 14 bodies that used to their own style of legacy in managing cases. JKSM faced various problem when holding the responsibility to standardize the policies and procedures of all courts that falls under 14 different states' jurisdictions.

All 14 states are tied with their own statutes and different procedural codes. In Kuala Lumpur, 5 statutes involved in the management of Shariah cases, namely:

1. Islamic Law Administrative Act (Federal Territories) 5005/1993
2. Islamic Family Law Act (Federal Territories) 303/1984
3. Shariah Court Civil Procedure Act (Federal Territories) 585/1998
4. Shariah Court Evidence Act (Federal Territories) 561/1997
5. Shariah Court Criminal Procedure Act (Federal Territories) 560/1997
6. Shariah Criminal Offences Act (Federal Territories) 559/1997

Basically Shariah Court in a state in Malaysia having a jurisdiction in that particular country only, pertaining to personal law of Muslim only, provided by Federal Constitution List 2 Item 1.

CONCLUSION

This paper discussed on the implementation of electronic court records management systems in Malaysian courts of law. The implementation is regarded as a success based on the case disposal rate in both courts, apart from the positive feedbacks from the system users as well as the public who enjoyed the effective service delivery. The legal issues faced at the initial stage of the implementation was rectified by amendment of related provisions of law by the Malaysian cabinet as well as proactive coordination efforts made by the organisations concerned with the judiciary systems.

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THE STRENGTH OF INDIVIDUAL RELATIONSHIPS AND EMPLOYEE KNOWLEDGE SHARING BEHAVIOR

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ABSTRACT

Firm's core competitiveness results primarily from its ability to innovate. Knowledge sharing plays an important role in promoting sustained innovation. This research examines the factors enabling knowledge sharing in a Research and Development (R&D) department of a Chinese commercial elevator firm. We find that the strength of individual relationships, contextual performance, and IT capability are positively correlated with the strong knowledge sharing behavior, while controlling for gender, education, and job tenure. Based on our findings, we draw both theoretical and managerial implications.

Keywords: Knowledge sharing, strength of individual relationships, contextual performance, and IT capability

INTRODUCTION

Firm's core competitiveness results primarily from its ability to innovate. Employee knowledge sharing plays an important role in promoting sustained innovation. Hence, it is important to encourage and foster knowledge sharing in the workplace. A great amount of research has examined the various enablers and barriers, such as organizational structure, technology, culture, management system, synergy, personal closeness to colleagues, and strategy on knowledge sharing in organizations [19][22]. Based on the existing literature, this research introduces two new variables, the strength of relationships and employee contextual performance, as the enablers for knowledge sharing and examines their relationships with employee knowledge sharing behaviors.

Social networking has recently made significant strides into the corporate intranets, and employee social networks become increasingly valuable assets to organizations. However, the mainstream of the existent research on knowledge sharing behaviors is mostly based on the traditional economics and focuses primarily on the impact of the individual attributes of employees. Little attention is given to examining the effects of employee social network structures and characteristics on employee knowledge sharing behaviors. In reality, knowledge

sharing must occur between at least two persons. Hence, the employee social networks must have influence on the way in which the employees share their knowledge.

Knowledge sharing has a pronounced aspect of human relationships [3] and is a selective interpersonal process [4]. Knowledge givers choose not only whom to share their knowledge with, but what knowledge to share based on whom the recipients are. Interpersonal interactions are a necessary condition for knowledge sharing and such interactions are always based on a certain level of interpersonal relationships [5][20]. Moreover, people share their knowledge when they are structurally embedded in the network [29]. Hence, the personal relationships have a profound connection to knowledge sharing. Lilleore and Hansen [19] show that personal closeness to colleagues is a key enabler for knowledge sharing in organizations. In this study, we propose a unique way of measuring the strength of relationships and investigate its correlation with employees' knowledge sharing behavior.

Knowledge sharing is mostly a voluntary act. No one can make someone share knowledge. For various reasons, individuals tend to hoard knowledge [1][2]. Hence, knowledge sharing can be considered as beyond one's normal job requirements, and individuals with a high level of job dedication and organizational commitment are more likely to share their knowledge to help others. Wasko and Faraj [29] find that people tend to share their knowledge when they perceive that it enhances their professional reputations. In this research, we examine the relationship between contextual performance and employee knowledge sharing behavior.

RESEARCH FRAMEWORK AND HYPOTHESES

Wasko and Faraj [29] argue that people contribute their knowledge when they are structurally embedded in the network, and when they perceive that it enhances their professional reputations. In our research framework, we relate 1) the embeddedness to the strength of relationships with the others in the social network; and 2) the perceived professional reputation enhancement to one's contextual performance. In addition, we believe one's IT capability also correlated positively with knowledge sharing.

Strength of Relationships and Knowledge Sharing

Knowledge sharing is the dissemination of knowledge. That is, individuals, via various means, exchange and discuss knowledge within the organization. The purpose is to expand the value and use of knowledge through the exchange of knowledge. By arguing that knowledge is the source of power, French [8] concludes that one who is equipped with the knowledge is also equipped with power and an easier access to resources and to opportunities for advancements and bonuses. Rewards and evaluations can influence employee behaviors greatly. If knowledge sharing behavior enables them to get rewarded or promoted, employees are more willing to share knowledge with others. Equally, Stevenson [26] believes that knowledge sharing is the allocation of resources. If managers exhibit more trust toward the subordinates, the extent of knowledge sharing will be greater.

Knowledge sharing takes place between knowledge owners and receivers. New knowledge is sometimes generated during the knowledge sharing process. Senge [25] explains the knowledge sharing process from the point of view of "learning" in which knowledge sharing includes the willingness to help the receiver understand, or learn, the meaning and connotation of the information. Davenport [7] defines "knowledge sharing" as a voluntary act and differentiates it from "report." Reports are information exchange behaviors based on certain rules, but knowledge sharing implies a conscious exchange behavior. Hendriks [11, p92] describes knowledge sharing as a process of communication by stating that "Knowledge sharing presumes a relationship between at least two parties." The owner of the knowledge shares through the process of externalization, and the recipient internalizes knowledge.

There are no coherent, integrated, theoretical frameworks of the motivational factors that explain how knowledge is transferred between knowledge providers and recipients [24, p71]. For instance, researchers interested in predicting knowledge sharing have used concepts from social motivation theory, such as trust, to help explain knowledge transfer [e.g., 18], while others have relied more on reward and incentive theory to study the impact of incentives on knowledge sharing [e.g., 15]. But no systematic attempts have been made to either compare or integrate these different potential motivational mechanisms that explain knowledge sharing.

Knowledge sharing is based on human relationships [3]. Wasko and Faraj [29] find that people share their knowledge when they are structurally embedded in the network. Knowledge sharing behavior is a selective interpersonal process under specific circumstances [4]. Knowledge givers choose not only whom to share their knowledge with, but what knowledge to share. Scholars ([5][20]) believe that interpersonal interactions are a necessary condition for knowledge sharing and such interactions are always based on a certain level of interpersonal relationship structure. The strength of relationships reflects the scope of communication and frequency of interaction among the individuals in the social networks. The wider the scope of exchange and the higher the frequency of interaction are, the higher level knowledge sharing among the individuals is. At the individual level, the strong ties are considered relatively more conducive than weak links for share refined and deep level of knowledge among the individuals [16]. This is because the higher frequency of social interaction provides the participants with more awareness of and exposure to unique knowledge, while an extensive network contacts can increase the team members' understanding of their skills and knowledge and help individuals find relevant experts when in need of knowledge [17]. Moreover, Ke, et al. [17] show empirically that the strength of interactions among the individuals, trust of their colleagues and network density have a positive impact on the behavior of knowledge sharing.

Based on the discussion, we propose our first hypothesis:

H₁: The strength of employee personal relationships in the social networks and knowledge sharing are positively correlated.

Contextual Performance and Knowledge Sharing

Contextual performance refers to activities that contribute to the social and psychological core of the organization and are beyond the required job mandates. They are the activities conducive to achieving organizational goals and include spontaneous behavior, organizational citizenship, pro-social behavior, dedication to organization and voluntary effort for completing tasks outside formal job requirements.

Most of managers find that knowledge sharing is not an easy task. For various reasons, individuals are reluctant to

share what they know [2]. Knowledge sharing is largely a voluntary act and cannot be forced. Therefore, it is a challenge for managers to foster policies that encourage and promote knowledge sharing behaviors. Wasko and Faraj [26] find that people tend to share their knowledge when they perceive that it enhances their professional reputations. Knowledge sharing can be considered beyond one's assigned job requirement. To share their knowledge to help others to do their jobs better and more efficiently, individuals must be willing to go beyond their required job mandates. This type of individuals should have high levels of contextual performance.

This line of discussion results in the following hypothesis:

H₂: The contextual performance of employees and knowledge sharing behaviors are positively correlated.

Individual IT Capability and Knowledge Sharing

In an environment of increasing complexity of work, fast changing organizational boundaries, the growth of virtual communities and geographically dispersed teams, it has become increasingly difficult to monitor and management knowledge [15]. IT can enhance knowledge sharing by shrinking temporal and spatial barriers between knowledge workers, and facilitating access to information about knowledge [12]. IT can support knowledge management in of the two ways: codification and personalization [10][11]. The former codifies and stores explicit and structured knowledge in knowledge bases. IT can be used to help people share and reuse knowledge through common storage. In personalization, tacit and unstructured knowledge is shared largely through direct personal communication. IT helps people locate each other and communicate to achieve complex knowledge transfer. In this context, we think an employee's ability to use various IT tools and applications is directly related to his knowledge sharing motivation [12] and behavior. Phang and Foong [22] find that information and communication technology (ICT) plays the critical role in facilitating and supporting the process of knowledge sharing in organizations.

By defining the ability of the employees to use the company's IT application platform and common IT software as IT capability, we propose our third hypothesis:

H₃: Individual IT capability and knowledge sharing behaviors are positively correlated

RESEARCH DESIGN

The main variables in this research are knowledge sharing behavior, employee relationships, contextual performance, and IT capability. For the contextual performance, we adopt the popular measurement model proposed by Van Scotter and Motowidlo [27]. Wang, et al. [28] translate this maturely established scale into Chinese and then back into English and empirically test it. For knowledge sharing behaviors, we use the measurement dimensions and scale proposed by Senge [25]. For employee IT capability, we adopt Peng [23] study, combined with the firm's demand for employee IT skills, to develop the scale for measurement.

For measuring the strength of employee relationships, we use both the frequency of interactions with the others and the degree centrality in the social networks. Granovetter [9] suggests that the relationships reflect the person-to-person and organization-to-organization exchange and contact ties. The relationship is different from the abstract relationships in the traditional sociological analysis. He was first to propose the concept of strength of ties and distinguish strong and weak ties. He suggests that the frequency of interaction is one of the main dimensions to measure the strength of ties. Alternatively, another approach for measuring the strength of relationships is to construct the network of relationships among the individuals and calculate the degrees centrality of the various social networks. The network centralities reflect the strength of individual ties. Practically, the social networks can be classified into advisory, informational, and emotional networks. By building three networks and extracting the degree centralities, the strength of the relationships can be measured. We adopt this principal by dividing the overall social networks of the focal firm into three relationship-based networks: emotional, advisory, and informational. We extract the individual degree of centralities as the second part of the measurement for the strength of the individual ties.

Data

From December 2010 to January 2011, we visited the R&D department of a commercial elevator manufacturer. It engages in design and development of commercial elevators. The R&D department has three offices with 80 employees. We distributed 80 questionnaires, of which 76 were returned, representing an effective rate of 95%. The individual attributes of the respondents are given in

Table 1. Based on the responses, we construct the entire social network in the department (see Figures 1a and 1b). We also extract the degrees centrality in the networks using software UCINET.

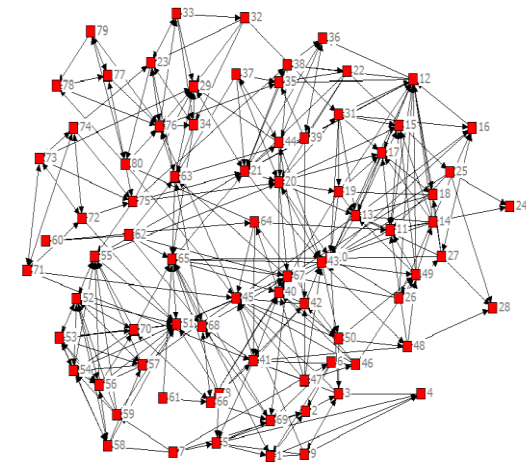


Figure 1a. Network for Help at Work

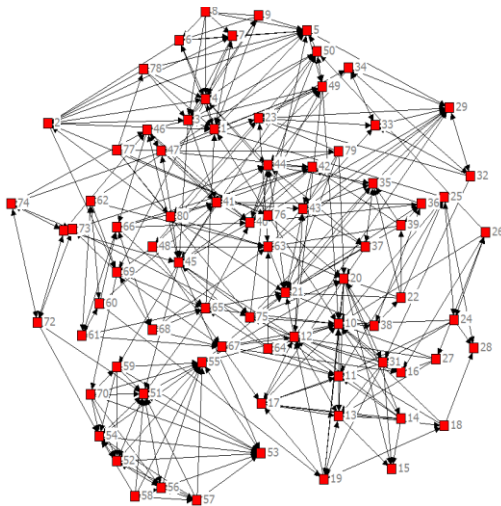


Figure 1b. Network for Work Discussion

Table 1. Employee Attributes

		Count	%
Sex	Male	60	79
	Female	16	21
Age (years)	<30	48	63.2
	30-35	23	30.3
	36-40	3	3.9
	41-45	2	2.6
	>46	0	0
Company Tenure (years)	<5	65	85
	5-10	1	1.5
	11-20	0	0
	>20	0	0
Work Experience (years)	<5	4	56.6
	5-10	26	3.2
	11-20	7	9.2
	>20	0	0
Education	Lower than	2	2.6

	Professional School		
	Professional School	6	7.9
	College	46	60.5
	MBA/MPM	22	29
Total		76	100

The tests for the reliability and validity of the degrees centrality and individual employee attribute measurement items are given in Tables 2 and 3. Table 2 shows that the reliability for the three measurement models are all greater than 0.6. For the validity, the Bartlett test of sphericity and the KMO test show that the measurement items are suitable for factor analysis with the KMO values greater than the threshold of 0.5 [13] and significant at the 0.000 level. The results indicate that the three constructs have good structural validity.

Table 2. The Reliability and Validity Tests

	Item ¹	Construct		Reliability
		Factor1	Factor2	$\alpha=0.787$
Knowledge Sharing	KS4	.820		0.79
	KS5	.819	-	
	KS7	.792	-	
	KS2	-	.868	0.658
	KS1	-	.741	
	KS3	-	.614	
	Eigenvalues after rotation	2.111	1.856	KMO=0.742
	Cumulative %	35.183	6.121	
Contextual Performance	Item ¹	Factor1	Factor2	$\alpha=0.13$
	CP15	.816	—	0.781
	CP14	.755	—	
	CP13	.753	—	
	CP12	.598		
	CP3	—	.82	0.61
	CP 1	—	.725	
	Eigenvalues after rotation	2.37	1.613	
IT Capability	Cumulative %	38.78	65.6%	KMO=0.845
	Item ¹	Factor1		Total
	IT3	.887	-	0.719
	IT2	.781	-	
	IT4	.29		
	Eigenvalues after rotation	1.98		KMO=0.6
	Cumulative %	64.26%	-	

¹ the detailed description of each item can be found in Part 1 of the questionnaire in the Appendix.

Measuring the relationships among the employees in the R&D department is relatively more complex. The previous studies demonstrate that the level of degrees

centrality of the social networks can reflect one's prestige in the network and strength of the ties to colleagues. Based on the questionnaire, we constructed eight employee social networks in the R&D departments. They are B1: Entertainment, B2: Talk, B3: Complaints, B4: Help at Work, B5: Advice, B6: Work Discuss, B7: Chat and B8: Email Communication. We can further divide the networks into work-related (B4, B5, B6, B8) and emotion-related (B1, B2, B3, B7). In addition, we also measure the frequency of communication among the employees. The results are in Table 3.

Table 3. Reliability and Validity Test for the Strength of Individual Relationships

Degree Centrality of the Social Networks ¹	Advisory Network	Emotional Network	Frequency of Communication	$\alpha=0.864$
B6	.924			0.922
B5	.914			
B4	.877			
B8	.766			
B1		.886		KMO=0.916***
B2		.878		
B3		.869		
Frequency of Interaction ²				
FI2			.880	0.820
FI1			.849	
FI3			.788	
Eigenvalues after rotation	3.239	2.647	2.292	KMO=0.822***
Cumulative %	32.3921	58.862	81.786	

*** Significant at the 1% level, suitable for factor analysis.

¹ the detailed description of each item can be found in Part 3b of the Questionnaire in the Appendix.

² the detailed description of each item can be found in Part 3a of the Questionnaire in the Appendix.

Correlation Analysis

The correlations between the non-network related variables are shown in Table 4, with gender, tenure and education being the control variables.

Table 4. Correlation Matrix

	Knowledge Sharing (KS)	Contextual Performance (CP)	IT Capability (ITC)	Strength of Relationships (SR)	Gender (G)	Tenure (T)	Education (EDU)
KS	1	-	-	-	-	-	-
CP	.392***	1	-	-	-	-	-
ITC	.207*	-.184	1	-	-	-	-
SR	.451***	.344**	.023	1	-	-	-
G	.024	-.208*	.115	.002	1	-	-
T	.196**	.081	-.075	-.102	-.018	1	-
Edu	.181	-.058	.069	.202*	.384***	-.344***	1
Two tail test. ***sig at the 0.01 level,**the 0.05 level, *the 0.1 level							

Table 4 shows that the correlations of knowledge sharing with contextual performance and strength of relationships are positive and significant at the 1% level, indicating that better relationships with the others and more excellent contextual performance are associated with the stronger his knowledge sharing behavior. In addition, knowledge sharing is weakly correlated with IT capability and job tenure.

MODELS

Using knowledge sharing as the dependent variable, we present our model as follows:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 Z_1 + \beta_5 Z_2 + \beta_6 D + \dots (1)$$

where x_1 is the strength of relationships (SR), x_2 is the contextual performance (CP), x_3 is the IT capability (ITP), Z_1 is tenure, Z_2 is education, and D is gender (1=male and 0=female). SPSS produces the following estimation results.

Table 5. Regression Results

Variable	Coefficient	VIF
Intercept	-1.293**	
SR	.457***	1.264
CP	.294***	1.334
ITC	.246**	1.114
Tenure	.308***	1.163
Education	.402**	1.265
Gender	-.006	1.141
Adj. R ²	0.424	
F-statistic	8.235***	

***sig at the 0.01 level, **the 0.05 level, *the 0.1 level

Table 5 indicates that the model is significant at the 1% level with the F-statistic being 8.235. The adjusted R square is 0.424 indicating a relatively strong goodness of fit. The variance inflation factor (VIF) for each of the independent variables is well below the threshold of 5.00, suggesting no evidence of multicollinearity. In addition, knowledge sharing is positively correlated with strength of individual relationships and contextual performance (both significant at the 1% level). For every unit increase in the relationship strength, there is a 0.457 unit increase in knowledge sharing. Similarly, for every unit increase in the contextual performance, there is a 0.294 unit increase in knowledge sharing. Individual IT capability is also positive and significant at the 5% level. A one-unit increase IT capability is associated with a 0.246 unit increase in knowledge sharing. With regard to the control variables, the results show that knowledge sharing is significantly related to tenure and education level, but not to gender. For every one year or one level increase in job tenure and education, knowledge sharing will be increased by 0.308 and 0.402 units, respectively.

Hence, our hypotheses H₁, H₂, and H₃ are fully supported.

DISCUSSION

The results from our study demonstrate that the strength of the individual relationships, contextual performance, and IT capabilities are the important knowledge sharing enablers. The strength of relationships results from the frequency of interpersonal interactions as well as the strong ties in the social networks. Our exercise

opens at least two new avenues for future research on knowledge sharing. First, the roles of the individual relationships and contextual performance in promoting and enabling knowledge sharing are established by this case study. Future framework for exploring the knowledge sharing may want to include these two dimensions or their extensions. Second, we propose an integrated measurement for the strength of individual relationships comprising the frequency of interpersonal interaction and the number of links incident upon an individual in the social networks. This novel way may provide some helpful insights for future efforts in the area.

Our findings offer several managerial implications. First, management should encourage active interpersonal interactions among employees in the workplace. This can strengthen knowledge sharing. Second, attentions should be given to the key personnel with the most ties in the various social networks because they can help the spread of new knowledge. Management should also focus on guiding employees to construct highly effective social networks. Third, employees who are willing to volunteer for additional work and help and cooperate with co-workers are important links in knowledge sharing. Proper incentive and reward systems should be set up to encourage employee to go beyond the regular job requirements and assist co-workers even when it is personally inconvenient. Fourth, enhancing employee IT capabilities play a positive role in promoting knowledge sharing. Fifth, the effects of the individual characteristics of the employee (seniority and education) are also positive enablers. This shows that the company should encourage employees with more seniority, who have higher level of project experience and the accumulation of knowledge, and with higher level of education to actively engage in sharing knowledge with the other employees. Forming teams with rational combinations of new and old employees, and those with different levels of education can promote interactions among the employees. Moreover, encouraging employees to be involved in different projects can help the rapid spread of organizational knowledge and provide efficient mechanisms for knowledge sharing. Finally, management should examine the synergies between the knowledge-sharing enablers and find the most efficient and effective way to promote the sharing of organizational knowledge.

CONCLUSION

Based on the data collected through the questionnaires, we construct the social networks in the R&D department of a Chinese elevator manufacturer and measure the strength of individual relationships, contextual performance, IT capability, and knowledge sharing behaviors. We analyze the correlations of knowledge sharing behaviors with the employee relationship characteristics as well as the individual attributes. Our results reveal that the strength of employee relationships and knowledge sharing are positively correlated. In other words, the employees with strong relationship ties in the social networks and more frequent interactions with the others have strong knowledge sharing behaviors. In addition, employee contextual performance and IT capability also positively correlated with knowledge sharing behavior.

This study has both theoretical and practical significance for examining and promoting knowledge sharing. However, the literature shows that many factors affect knowledge sharing behavior. Different corporate cultures may result in differences in the structures of social networks. This may lead to different mechanisms for the correlation between the strength of relationships and knowledge sharing behavior. To enrich and expand the research on knowledge sharing behavior, other variables, such as corporate culture, industry type, and firm location, may be needed to include in the model. In addition, more data should be collected to allow both longitudinal and cross-sectional analyses. In the future, we will conduct our research at multiple firms hoping to make our conclusions more general and practical.

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Appendix: Questionnaire**Part 1 Personal Information**

1. Name : _____ Department : _____
Position: _____
2. Total years of working: _____ Length with the company: _____
Gender: ☐Male ☐Female
3. Age: ☐ Below 30 ☐ Between 30 and 35 ☐ Between 36 and 40 ☐ Between 41 and 45 ☐ Above 46
4. Education Level: ☐ Below college ☐ college ☐ Bachelor ☐ Master ☐ MBA/MPM

Part 2 IT capability, contextual performance, knowledge sharing and individual relationships

IT1. Your familiarity of using the information system provided by your company:

- ☐Very unfamiliar ☐Not familiar ☐ Generally familiar ☐ familiar ☐proficient

IT2. Your familiarity in using office software:

- ☐Very unfamiliar ☐Not familiar ☐ Generally familiar ☐ familiar ☐proficient

IT3. Your familiarity of using the operation system:

- ☐Very unfamiliar ☐Not familiar ☐ Generally familiar ☐ familiar ☐proficient

IT4. Your understanding of computer hardware:

- ☐Very unfamiliar ☐Not familiar ☐ Generally familiar ☐ familiar ☐proficient

IT5. Which of following tool do you usually use to communication at work?(Please select all that apply)

- A、Company email B、MSN C、QQ D、Short Message E、Telephone/Mobile phone F、Others _____

IT6. How many hours, on average, do you spend on the Internet at work?

- A、1-2 hours B、3-4 hours C、5-6 hours D、above 7 hours E、don't use Internet

Please circle the degree that you agree with the following sentences. 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree					
	1	2	3	4	5
Contextual Performance					
CP1. I give compliments to my colleagues when they succeed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP2. I will give support and inspiration to my colleagues when they encounter personal troubles.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP3. If something I do would affect my	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

colleagues, I will inform them beforehand.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP4. I only talk about something that benefit my colleagues and group.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP5. I will encourage others to overcome interpersonal obstacle to get along with each other.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP6. I treat others equally.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP7. I am proactive to help others.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP8. I will spend my break time working in order to guarantee the completion of my task on time.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP9. I care about the important details at work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP10. I work extra hard.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP11. I pursue challenging job.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP12. I am self-disciplined at work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP13. I am proactive to solve problems at work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP14. I am insisted on overcoming difficulties to complete tasks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CP15. I am active and enthusiastic to complete the difficult tasks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Knowledge Sharing					
KS1. I usually provide others with the internal materials of my organization, including documents, manuals, technical reports, methods, modes, patents and so on.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KS2. I usually provide others with the regulations and the standard operational rules of working made by the company, such as employees' code of conduct, operating principles and strategy of my enterprise.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KS3. I usually provide others with knowledge acquired from the Mass media (such as website, news, magazines, broadcasting, etc.).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KS4. I usually provide others with the locations of the knowledge they need. For example, when someone inquires about certain knowledge, although I have no idea of it, I know the place he/she can find it, such as, the document that he/she needs is located in the file cabinet of one specific department, or the program needed is stored in some databases, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KS5. I usually provide others with the person	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

who has the knowledge they need. For example, when someone inquires me about some certain knowledge, although I have no idea of it, I know who he/she can inquire about it, such as, who is the expert in CRM(customer relationship management), or who is strong in multimedia network technology, etc.					
KS6. I usually provide others with specific working experience and professional knowledge that I have gained from the previous tasks in this company or other places I worked.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
KS7. I usually provide others with specific knowledge and skills I have gained from the training courses held by the company and other advanced seminars, such as, knowledge management, CRM symposium, etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Part 3. Strength of relationships

Part 3a. Frequency of Interactions (Wang, 2009)

Instructions: Please use the following scale to indicate the degree of agreement with the items below:

1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

	1	2	3	4	5
FI1. I keep constant contacts with my colleagues.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FI2. I have frequent communications with my colleagues.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FI3. I have good relationships with my colleagues.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FI4. I often go out with my colleagues after work.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FI5. The colleagues in my department have a strong solidarity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Part 3b. Social Networks

Instructions: The following questions are intended to collect data by using the employees' names who keep frequent contacts with the others in different contexts.

	Fill in at least 5 names according to the questions.
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With whom do you usually discuss the working issues?	
From whom do you usually ask for advices before you making important decisions at work?	
With whom do you usually go out after work?	
To whom you turn for help when having non-work related hardships?	
With whom do you usually chat?	
To whom would you complain when you meet setbacks at work or are blamed by your supervisors?	
To whom would you turn for help when facing work related problems?	
With whom do you usually communicate via Email?	

Instructions: Please fill in, not more than 5, the employee IDs for each of the following questions.

		Employee IDs (not more than 5)
Emotional network	B1: with whom you usually do entertainment activities after work	
	B2: to whom you turn for help when having non-work related hardships	
	B3: to whom you complain when facing setbacks at work or blamed by supervisors	
Advisory Network	B4: to whom you turn for help when facing work related problems	
	B5: with whom you consult before making important decisions at work	
	B6: with whom you often discuss work related issues	
Information Network	B7: with whom you usually chat	
	B8: with whom you usually email communicate and exchange	

AN ONTOLOGY-BASED COLLABORATIVE INTERORGANIZATIONAL KNOWLEDGE MANAGEMENT NETWORK

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ABSTRACT

Web contents can be represented in a structural form by a finite list of vocabularies and their relationships using ontologies. The concept of ontology and its related mediation methods is capable of enhancing the collaboration among Knowledge Management (KM) approaches that only focus on managing organizational knowledge. Those KM approaches are developed in accordance with organizational KM strategies and business requirements without the concern of system interoperation. In this research, an ontology-based collaborative inter-organizational KM network is proposed to provide a platform for organizations to access and retrieve inter-organizational knowledge in a similar domain.

Keywords: ontology mediation, ontology mapping, ontology merging, ontology integration, knowledge management

INTRODUCTION

Over the past two decades, a lot of efforts have been placed in order to integrate heterogeneous information systems. This integration is essential because systems of different characteristics are able to communicate, cooperate, exchange information as well as reuse knowledge and services with one another. Especially in the era of the Internet, a transaction can hardly be completed without making use of others' data, information, knowledge and services, for instance, when customer is shopping in an online store, s/he may need to seek comments on the quality of a particular product from an external forum. Once s/he decides to purchase the product, the online store will have to contact related financial institutes for payment verification and confirmation. The online store is also required to arrange delivery service with shipping company. Such a simple online shopping transaction involves interoperation of at least three heterogeneous information systems, the complexness could be imagined if it is a multi-million dollar trade that involves the participation of more enterprises.

Artificial intelligence researchers first applied the concept of ontology in intelligence system development so that knowledge could be shared and reused among artificial intelligence systems. Ontology as a branch of philosophy is the science of what is, of the kinds and structures of objects, properties, events, processes and relations in every area of reality [26]. Ontology can be further elaborated as a particular system of categories accounting for a certain vision of the world [11]. The term, ontology, was then borrowed by artificial intelligence community and Tom Gruber's definition

was widely accepted within the community: an ontology is an explicit specification of a conceptualization while a conceptualization is an abstract, simplified view of the world that we wish to represent for some purpose [10]. Later on, Borst [5] refines Gruber's definition by labeling an ontology as a formal specification of a shared conceptualization. Based on Gruber's and Borst's definitions, Studer, Benjamins and Fensel [27] make the following conclusion: 1) an ontology is a machine-readable specification of a conceptualization in which the type of concepts used and the constraints on their use are explicitly defined, and 2) an ontology should only capture consensual knowledge accepted by large group of people rather than some individual. By representing knowledge with representational vocabulary in terms of objects and their interrelated describable relationships, inference engine and other application program from one intelligence system will be able to understand the semantic of knowledge in another knowledge base.

The popularity of the Semantic Web further magnifies the importance of ontology. The Semantic Web is the extension of the current one, in which web content is represented in a structural form within ontologies by a finite list of vocabularies and their relationships [4]. In this way, ontologies enable computer program, software agent and search engine to understand the semantics, thus making it possible for them to process the web content. Ontologies also provide a shared understanding of a domain which is necessary to overcome differences in terminology from various sources [2].

Unfortunately, it is unrealistic to expect all individuals and organizations will agree on using one or even a small set of ontologies [6]. The adoption of such an approach is problematic. On one hand, it is lengthy and non-trivial to define and maintain a large globally shared ontology, on the other hand, the globally shared ontology approach may hinder a system from reflecting its actual business requirements due to the fact that the design of the system is restricted by terminologies defined in the ontology [14]. Researchers such as Berners-Lee, Hendler and Lassila [4] state that there would be a large number of small domain specific ontologies developed by communities, organizations, departments or even individuals. While multiple ontologies allow systems to be designed according to their actual requirements without committing to a particular set of terminologies, data heterogeneity caused by multiple ontologies has become an obstacle for the interoperation of systems. Since vocabularies and their relationships defined in the ontologies are

inconsistent, therefore it is impossible for one system to understand and reuse other ontologies unless the ontologies are reconciled in some form. The above inconsistent problem caused by multiple ontologies is commonly termed as ontology mismatches.

This research describes the three main mediation methods used to reconcile mismatches between heterogeneous ontologies. The research also investigates the application of ontologies and its mediation methods in the aspect of Knowledge Management (KM). The rest of the Chapter is organized as follows. Section 2 describes various approaches of ontology mediation. Section 3 discusses the application of ontology and its mediation methods in KM. This includes the development of a proposed mediation selection framework and ontology-based collaborative KM network. Finally, conclusion is given in Section 4.

ONTOLOGY MEDIATION APPROACHES

Based on the actual requirements, organizations and individuals are expected to develop their own ontologies of different languages, scopes, coverage and granularities, modelling styles, terminologies, concepts and encodings. To reuse other ontologies of different types, ontology mediation is required to reconcile mismatches between heterogeneous ontologies so that knowledge sharing and reuse among multiple data sources can be achieved [22]. There are three major kinds of ontology mediations which include mapping, merging and integration. Ontology mapping is a process of relating similar concepts and relations from different ontologies to each other in which the correspondences between different entities of the two ontologies are formulated as axioms in specific mapping language [6]. Since the involved ontologies do not require any adaptation, ontology mapping often specifies just a part of the overlap between ontologies which is relevant for the mapping application [23]. Two common approaches used to establish mapping between ontologies are listed as follows.

- The first approach is to relate all ontologies to a common top-level ontology so that different ontologies are mapped together indirectly by the top-level ontology [6]. Consequently, conflicts and ambiguities can be resolved since concepts used in different ontologies are inherited from the common ontology. However, this approach has three major drawbacks. First, constructing a large-scale common top-level ontology from scratch is never a simple task. Even if we take a simpler path by merging various local ontologies together, the experiences of building the Suggested Upper Merged Ontology (SUMO) told us that the actual merging process was trickier than expected, not only because there was inconsistency between chunks of theoretical content but also because there were structural differences between the local ontologies [18]. Second, this approach can only be adopted in a relatively stable environment where maintenance is minimal because a substantial amount of resources and overheads are required to maintain a common top-level ontology. Third, established mappings between local ontologies and top-level ontology can easily be affected by the elimination and

addition of local ontologies as well as changes in either local or common ontologies because local ontologies are related indirectly with each other through the common ontology.

- Rather than mapping all ontologies to a common top-level ontology, one-to-one mapping approach requires mappings to be created between each pair of ontologies [22]. The lack of a common top-level ontology in this approach makes it possible to be adopted in a highly dynamic environment. This advantage may be offset by the lack of common terminologies, thus increasing the complexity of defining mapping between local ontologies. Another major drawback of this approach occurs when a large number of heterogeneous ontologies are involved in the interoperation. Such an interoperation will greatly increase the amount of mappings and extra effort is required to control and maintain the mappings.

The second type of ontology mediation is merging. Unlike mapping that links two separate ontologies together in a consistent and coherent form, ontology merging creates a new ontology (in one subject) by unifying two or more different ontologies on that subject and it is usually hard to identify regions of the source ontologies from the merged ontologies [21]. As compared with mapping that keeps the original ontologies unchanged, merging requires at least one of the original ontologies to be adapted so that the conceptualization and the vocabulary match in overlapping parts of the ontologies [7]. While a majority of semantic web researchers foresee the main stream would switch to the approach of developing enormous amount of small domain specific ontologies, McGuinness et al. [16] argue that some of the industries or organizations still require to develop very large and standardized ontologies, for instance, SNOMED CT is a comprehensive clinical ontology developed by the College of American Pathologists that contains about 344,549 distinct concepts and 913,697 descriptions [15]. Theoretically, it is more efficient and effective to merge existing ontologies than to build a large ontology from scratch. In practice, the process of ontology merging is more than just simple revisions, improvements or variations of the source ontologies since the involved ontologies are developed by different people for different purposes with different assumptions and using different vocabularies [21].

One of the most important phrases in the process of ontology mapping and merging is ontology matching. In general, ontology matching can be defined as the process of discovering similarities between two ontologies with the purpose of establishing semantic relationships in between [27]. It determines the relationships holding between two sets of entities that belong to two discrete ontologies. In other words, it is the process of finding a corresponding entity in the second ontology for each entity (for example, concept, relation, attribute and so on) in the first ontology that has the same or the closest intended meaning. This can be achieved by analysing the similarity of the entities in the compared ontologies in accordance with a particular metric [8]. Ontology matching (or similarity computation) can be processed exploiting a number of different techniques. To

provide a common conceptual basis, researchers have started to identify different types of ontology matching techniques and propose classifications to distinguish them, for example, Shvaiko and Euzenat [25] propose a classification that consists of ten ontology matching techniques. Another example is the classification framework developed by Leung, Lau and Fan [14]. Their framework provides an effective method to identify seven types of matching techniques and its related executive approach simply by examining the input of mediation system. The seven types of techniques are string-based, linguistic resources, constraint-based, alignment reuse, graph-based, taxonomy-based and model-based.

Finally, the third type of ontology mediation is integration. Pinto and Martins [21] define ontology integration as a process of building an ontology in one subject reusing one or more ontologies in different subjects and it is always possible to identify regions of the source ontologies from the integrated ontologies. Source ontologies may need some sort of refinements before they can be aggregated, combined and assembled together to form the resulting ontology. It is also important to include ontology integration in the early stage of the ontology building process, preferable during conceptualization and formalization, so as to simplify the overall ontology building procedure.

Application of Ontology in Knowledge Management

The concept of ontology and its related mediation methods can also be applied to solve the interoperation problem in the distributed KM environment. At the very beginning, KM is emerged with the purpose of preserving and capitalizing on organizational knowledge for the future benefit of organizations. KM encourages organizations to create and use knowledge continuously for the innovation and enhancement of service, product and operation. Simultaneously, it also aims to improve the quality, content, value and transferability of individual and group knowledge within an organization [17]. This is achieved by organizing formal, direct and systematic process to create, store, disseminate, use and evaluate organizational knowledge using the appropriate means and technologies.

Nonaka, Toyama and Konno [19] suggest that there are four methods to create organizational knowledge by means of interaction between explicit and tacit knowledge. While tacit knowledge is personal, complex and hard to communicate and formalize because it is gained through individual insights overtime and is resided in human, mind and body, explicit knowledge is structured, relatively simple and can be captured, recorded, documented, codified and shared using formal and systematic language [9]. The first method to create knowledge is socialization. It is the process of developing new tacit knowledge from tacit knowledge embedded in human or organization through experience sharing, observation and traditional apprenticeship. The second method is called externalization. This is the process of turning tacit knowledge into new explicit knowledge simply by transforming tacit knowledge in the form of document such as manual and report. The third method is combination. This is the process of merging and editing “explicit knowledge from multiple

sources” into a new set of more comprehensive and systematic explicit knowledge. The last one is called internalization. This is the process of embodying explicit knowledge as tacit knowledge by learning, absorbing and integrating explicit knowledge into individual’s tacit knowledge base.

The second and third stage of KM, store and disseminate, are often linked with technologies. Explicit knowledge created is collected and stored in some sort of database or knowledge base in which the users can access using “search and retrieve” tools, intranets, web access and applications, groupware and so on [1]. The retrieved knowledge can then be used by knowledge workers to add value to current business process, implement and coordinate organizational strategy, predict trends in the uncertain future, deliver new market values, create new knowledge, solve existing problems and so on [3]. The fifth stage of KM is knowledge evaluation. This phrase eliminates incorrect or out-dated knowledge [1]. In other words, organization must keep creating new knowledge to replace any knowledge that has become invalid.

Unfortunately, it is shown that some of the KM approaches, ranging from industrial specific, theoretical, to procedure-wise, are incompetent to cooperate with the current distributed knowledge environment, especially those that are designed to manage merely organizational knowledge, for example, the re-distributed KM framework is developed to manage organizational help desk knowledge [12]. Those approaches are tailor-made according to different organizational KM strategies and business requirements without the concern of system interoperation. The lack of interoperability means that heterogeneous Knowledge Management Systems (KMSs) from different organizations are not able to communicate, cooperate, exchange as well as reuse knowledge with one another. Wagner and Buko [28] argues that knowledge-sharing in an inter-organizational network allows a richer and more diverse body of knowledge to be created as compared with sharing in one organization.

The non-collaborative KMSs have several disadvantages for both knowledge workers and knowledge engineers. In terms of knowledge workers, they have to spend a lot of time and effort to look for relevant knowledge from different KMSs because they are often required to access knowledge from other knowledge sources in order to complete their works in the knowledge explosion era, for instance, an investment manager has to retrieve companies’ financial reports, share performance reports and regional economy reports from external sources if s/he wants to adjust the proportion of a particular share in a investment portfolio. In terms of knowledge engineers, they have to waste a lot of resources in creating and updating organizational knowledge even though the same knowledge is available in other KMSs. As external source of knowledge is essential for organizational performance, a new inter-organizational KM practice is required to enhance the interoperability among independent KMSs and to encourage the sharing of knowledge across organizational boundaries in their business networks [20].

Nevertheless, the absence of a common language or

standardization has put up a barrier to prevent the collaboration of KMSs [24]. Although the emergence of middleware technology has provided a way to enhance the interoperability of KMSs, the concept of middleware can hardly be accommodated in the era of the Internet as each pair of KMSs are required to implement a tailor-made middleware for interoperation [13]. Since a single KMS is interconnected with a huge amount of systems via the Internet, it is impractical to customize and install a middleware for each connection. Another deficiency of middleware is that even if the involved systems only undergo minor modification, the middleware may require a complete re-construction.

Ontology-based Collaborative Inter-organizational Knowledge Management Network

Let us consider the following scenario. At University A, if a lecturer does not know how to send customised email to his/her students using Mail Merge, the first thing s/he can do is to access the KMS managed by the IT help desk of the university. S/he can then search the relevant knowledge by making selections from several drop-down lists on the user interface of the KMS that can best describe Mail Merge. If the knowledge is available, then it will be shown on the user interface of the KMS. If not, s/he will have to search again in knowledge bases offered by University A or other organizations. Unfortunately, the process needs to be repeated for every single knowledge base until s/he can find the desired knowledge. Finally, if s/he still cannot find any related knowledge, s/he may choose to search again using other search mechanisms such as Yahoo and Google.

In this research, we propose to use ontology and its related mediation methods to solve the collaboration problem of heterogeneous KMSs in the Internet environment. Ontology is incorporated to allow explicit knowledge to be annotated in the form of machine process-able metadata. Although different organizations possess their own set of ontologies, the mediation methods are capable of reconciling the underlying heterogeneities of ontologies. In this way, the concept of ontology and mediation enables organizational KMS to understand incoming request and the returned knowledge, thus making it possible for them to collaborate and communicate with each other. We argue that the knowledge reusability and mismatches reconcilability of ontology and its related mediation methods can further contribute towards reformation of existing KM frameworks that focus only on managing organizational knowledge. Therefore, we propose to develop an ontology-based collaborative inter-organizational KM network that provides a platform for organizations to access and reuse inter-organizational knowledge with a similar domain. Here, inter-organizational knowledge is defined as a set of explicit knowledge formalized and created by other organizations. In the network, the formalized inter-organizational knowledge is reusable in a way that it can be retrieved by any organizations to support their own KM processes in terms of knowledge creating, storing, dissemination, using and evaluation.

Each network should only contain knowledge of a specific domain to ensure knowledge workers can retrieve relevant

knowledge in an efficient manner, for example, an IT network should only provide knowledge in the discipline area of IT. Once an organization recognizes the need for a certain type of knowledge, the organization can invite other organizations and knowledge providers to establish a domain specific knowledge network, for example, an IT help desk of a university can decide to invite IT help desk of other universities and organizations as well as IT service providers to establish a knowledge network that contains only IT knowledge. When a network for a particular knowledge becomes mature, organizations in need may choose to join instead of establishing new one. Within the network, each organization or knowledge provider must commit to a mutual agreement to allow other participants to access an agreeable portion of ontology and the associated knowledge in its knowledge base. Besides, a single organization can commit to more than one knowledge network regardless of domain, for instance, a university may choose to commit to networks of IT, economics, mechanical engineering, education and chemistry whereas IT help desk of Company A may choose to commit to network of hardware and software..

Selection Framework for Ontology Mediation

Before continuing the description of the proposed network, the participating organizations must first make four important decisions related to ontology mediation. Figure 1 illustrates a selection framework for ontology mediation in the form of a matrix. The first decision is whether to adopt top-level ontology or one-to-one as the network level mapping approach. As this decision is on the network level rather than an organizational aspect, the organizations as a whole must compromise in order to select the most appropriate mapping approach for the benefit of the entire network. The decision process should include a thorough assessment and discussion from the aspects of resources, expertise and frequency of modification among all organizations in the network. The top-level ontology approach can only be applied to an environment where maintenance effort is minimal even though such an approach can provide a better mechanism to resolve conflicts and ambiguities. Whenever a minor modification is performed in one of the ontologies in the network, the shared ontology used in the top-level ontology approach may need a complete reconstruction. The organizations must also make sure that they have sufficient resources and expertise to build the shared ontology. If frequent maintenance is required or resources and expertise are insufficient, it may be more appropriate to use the one-to-one approach.

The second decision is whether to perform mediation automatically or semi-automatically. Mediation can be performed semi-automatically which requires the support of automatic tools as well as human intervention. The forms of support provided by automatic tools include similarity computation, post-mediation verification, validation, critiquation as well as conflict recognition and resolution. Although semi-automatic mediation could have a better performance than the manual one in terms of accuracy, it still substantially relies on human efforts and can be time consuming. Without human intervention, the process of

semi-automatic mediation cannot be completed, thus compromising accuracy of the mediation result. As semi-automatic tool is not capable of supporting mediation on-the-fly, it would be ideal to perform mediation automatically. Unfortunately automatic tools are unable to detect and interpret concepts that do not have close correlation. Moreover, it may also fail to handle any unforeseeable situations as the tool is designed to perform mediation under certain pre-defined conditions. However, if automatic mediation is adopted and inference mechanism is built on top of it, then inaccurate results can reduce the value of the mediation process.

The third decision is whether to adopt merging, mapping and/or integration as the desired mediation method for each organization. Each organization can choose one or more methods based on its own need. The concept of mapping enables ontology to be developed in response to its actual business requirement and is more suitable in a fluctuant business environment. Here, fluctuant business environment refers to an environment where organizations need to modify their ontologies in a frequent manner. Unless ontology has undergone major modification, simple modification, such as adding or deleting a concept from ontology, may merely require updating the mappings accordingly. Alternatively, merging is an appropriate method for creating an ontology that combines common views of multiple source ontologies. In other words, the merged ontology should include all possible correspondences and differences among the entire set of source ontologies. As a result, the merged ontology could act as 1) a single ontology used to substitute individual source ontology, 2) a shared ontology (reference point) used in top-level ontology mapping approach, or 3) an organizational ontology that includes all possible views of other organizations' ontologies. Unlike merging, integration selects only opposite modules from individual source ontologies to form an integrated ontology. Thus, integration is appropriate for organizations to customize ontologies based on their own needs. For example, the library at University A can customize a KM-based ontology by integrating portions of ontologies derived from other libraries and other academic publishers.

The final thing needs to be considered is whether to adopt single or multiple matching techniques. In the decision process, organizations must also take execution duration, acceptable level of matching accuracy and resources level for implementation into consideration. In general, multiple strategies are expected to generate more accurate result than single matching technique; however it is not always the case. The choice of aggregation algorithm and cut off point also plays an important role in determining the level of matching accuracy. When choosing multiple strategies as its matching technique, organization must conduct a series of experiments with the purpose of finding the right combination of multiple strategies, aggregation algorithm and cut off point to produce the most accurate result. Compare with single matching technique, multiple strategies are relatively difficult to design and implement and it requires longer execution time.

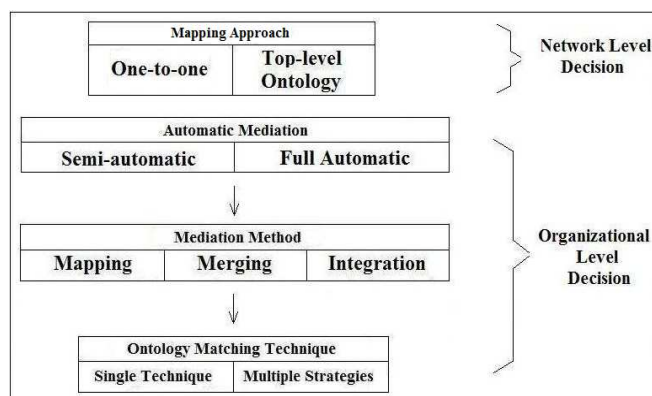


FIGURE 1: SELECTION MATRIX FOR ONTOLOGY MEDIATION

Operation of the Ontology-based Collaborative Inter-organizational Knowledge Management Network

The reconcilability of ontology mediation allows the participating organizations to reuse inter-organizational knowledge within the network even if there are fundamental differences among organizations in terms of KMS structures and formats. Under mutual agreement, organizations are permitted to retrieve inter-organization knowledge and the retrieved knowledge can be reused to support the five stages of KM process. Conventionally, technology has very limited contribution in knowledge creating stage especially in socialization, externalization and internalization where tacit knowledge is involved, for example, word processing tools can be used to record and visualise explicit knowledge in externalization and internalization, whereas communication tools such as email and telephone provide platforms for exchanging explicit knowledge in socialization.

However, ontology merging tool can provide a practical way to create knowledge by combining two or more ontologies together semi- or automatically in the network. This can be achieved on both network and organizational level. On the former level, merging tool is capable of creating a shared ontology for top-level mapping approach that contains common views of all organizational ontologies in the network. On the latter level, organization can create its own domain specific ontology by merging relevant ontologies from other organizations within the network. In addition, ontology integration tool provides an alternative way to create knowledge. Using integration method, organization can create its own knowledge by integrating relevant parts of ontologies from other organizations in the network into its own ontology building process. Both merging and integration enable organizations to reuse not only the contents of other ontologies but also their associated inter-organizational knowledge stored in the knowledge bases of other organizations. While ontology merging and integration are never a trivial task even with the assistance of automatic tools, they are still less demanding than building it from scratch.

Knowledge dissemination tool allows user to retrieve and use

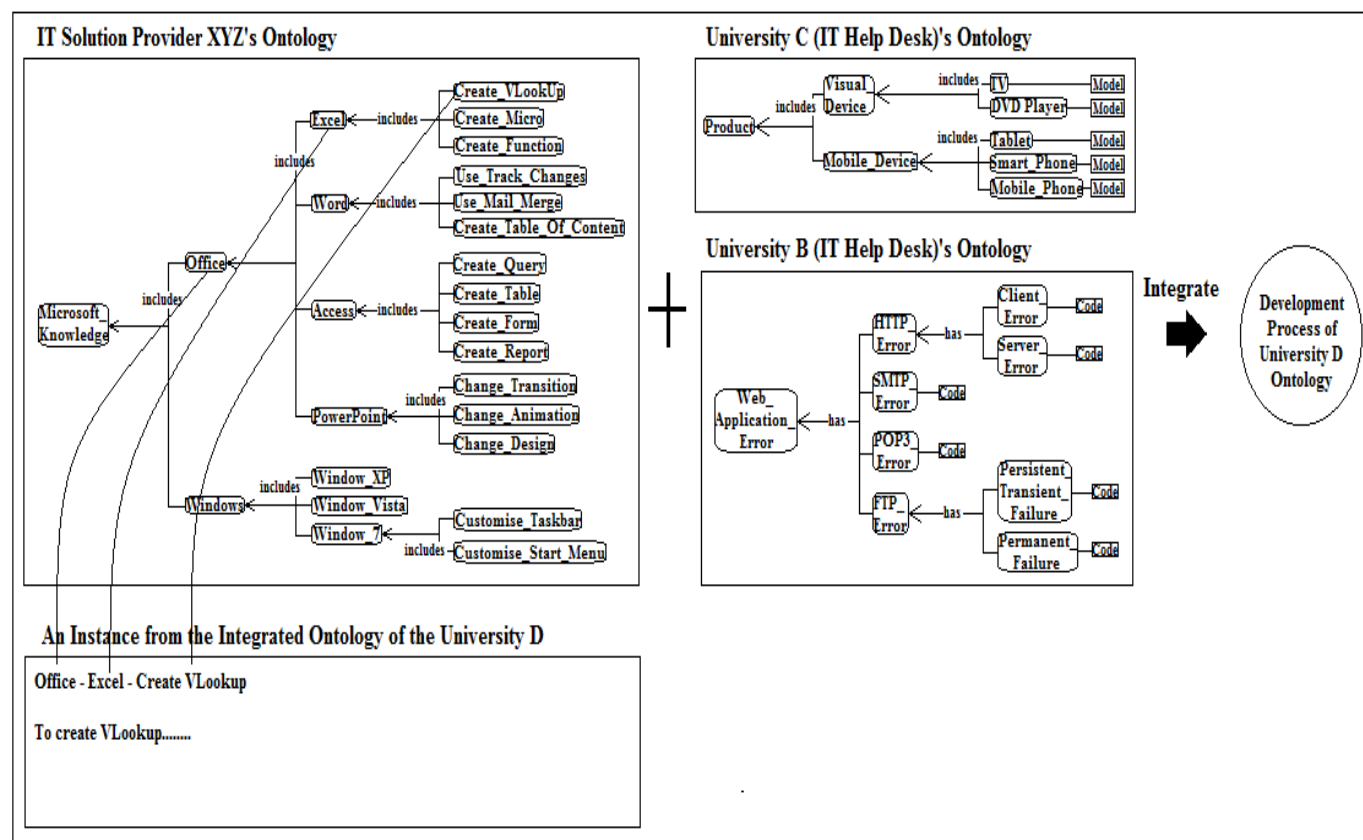


FIGURE 2: PROCESS TO DEVELOP UNIVERSITY D'S ONTOLOGY USING INTEGRATION METHOD

knowledge from organizational knowledge repository. If user cannot find suitable organization knowledge, s/he has to seek from other external sources. This can be achieved by creating mappings among ontologies of different organizations either semi- or automatically with the support of ontology mapping tools. The established mappings allow one KMS to access another KMS in the same network. Besides, it is also practical for mapping to be performed on-the-fly. In this case, automatic mapping tool is responsible to look for, select and establish mapping with the most relevant concepts and properties from other ontology in the network. Whenever the required knowledge is not available in the organizational repository, the KMS is able to retrieve and deliver inter-organizational knowledge in a "black box" through the establishment of mappings. In addition, inter-organizational knowledge can be reused to support knowledge evaluation process. This is accomplished by setting up dedicated mapping between two or more ontologies. Once a piece of inter-organizational knowledge is updated, this it will be translated into a suitable format and delivered from source knowledge base to the target automatically via the pre-established mappings. To demonstrate the reconcilability of ontology mediation and reusability of inter-organizational knowledge in the network, let us consider the following scenario.

Assuming IT help desk of University A realizes that there is an increasing demand in IT related knowledge and this demand cannot be satisfied with the current knowledge repositied in its knowledge base. Consequently, University A decides to invite IT service providers and IT help desks of other organizations

to establish a network that contains IT related knowledge which include help desk of University B, University C and University D, Application Service Provider ABC and IT Solution Provider XYZ. Except for University D, all other participating organizations possess ontologies. Figure 3 shows a partial view of the classification ontology adopted in the IT help desk of University A. In this ontology, the concept software problem has two concepts, performance problem and functional problem, as its subclasses. Each subclass can be further categorized according to its own needs, for instance, University A supports four type of standard application software in its IT help desk. Thus, the ontology reflects this by including concept Internet Explorer problem, McAfee Virus Scan problem, Ms Office problem and Adobe PDF problem as an extension of concept standard software problem. Figure 3 also shows a partial view of the classification ontology in IT Solution Provider XYZ. There are two major subclasses under concept Microsoft knowledge, namely concept Office and Windows. Similar to University A, each subclass can be categorised into a set of more specific subclasses, for example, concept Excel, Word, Access and PowerPoint are specified as subclasses for concept Office. As the network supports IT related knowledge, both University A and IT Solution Provider XYZ are willing to share their IT knowledge that belongs to concept software problem and Microsoft knowledge respectively for mutual benefits.

After careful consideration, the six organizations have reached a mutual agreement not to adopt top-level ontology as the network-wide mapping approach. This decision is based on the fact that there will be many more organizations wishing

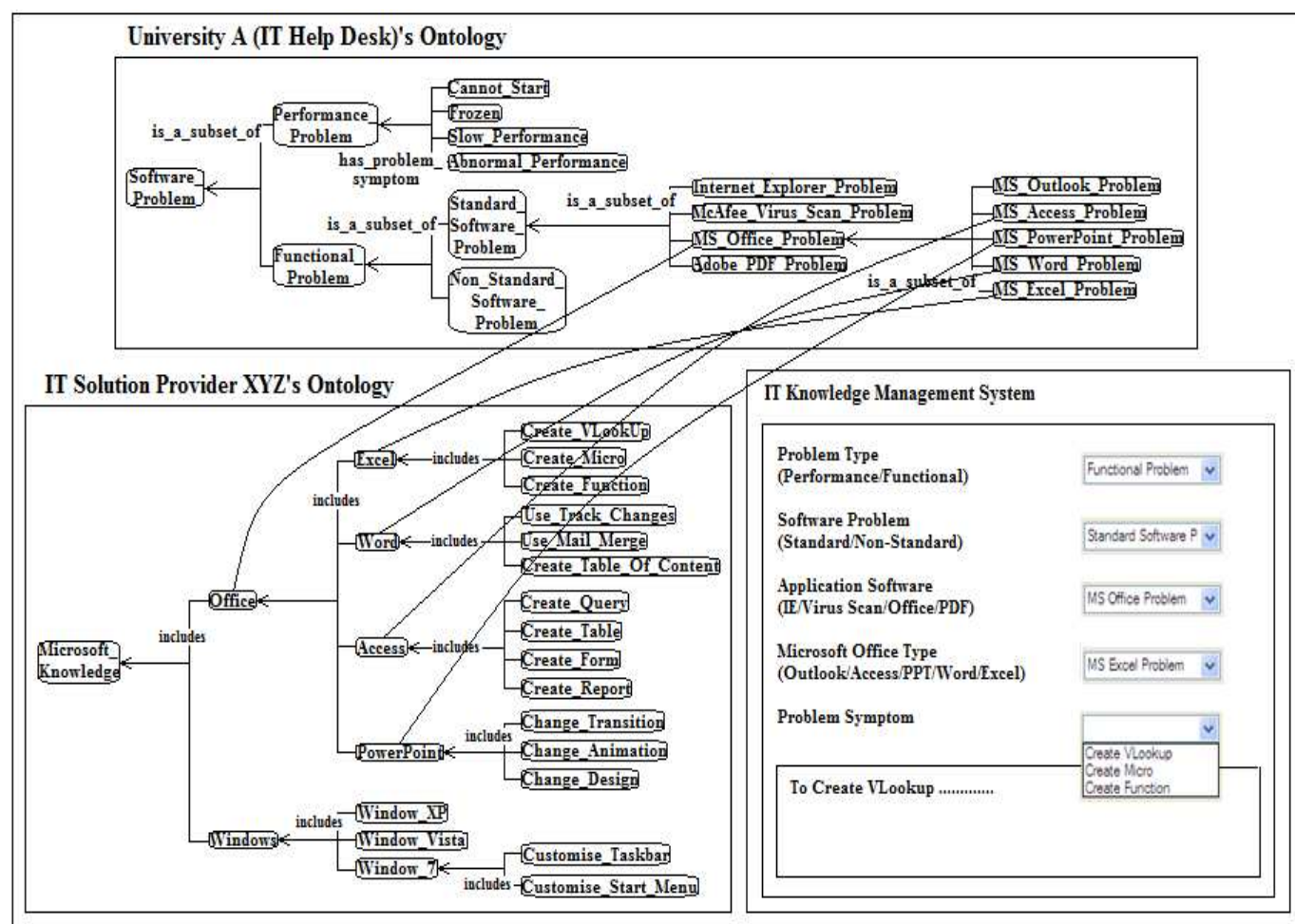


FIGURE 3: INTER-ORGANIZATIONAL KNOWLEDGE RETRIEVAL AND REUSING PROCESS

to join the newly established network, so the shared ontology built for the top-level ontology mapping approach may require to undergo a series of reconstructions. Although they have sufficient expertise and resources to build and reconstruct the shared ontology, it is not cost effective to do so. In addition, the reconstruction works will definitely affect the stability and performance of network-wide mediation because the shared ontology will be mapped by all other ontologies as a reference point. At this moment, the organizations prefer to use one-to-one mapping approach. However they have agreed to review the mapping approach after the organizations wishing to join the network stabilized.

As the IT help desk of University D does not possess ontology, the help desk has to create one in order to fulfil the requirement of joining the network. Instead of building from scratch, the help desk decides to reuse ontologies from other organizations and integrate them into its own development process using ontology integration method. However, the chosen ontologies must contain IT knowledge in the areas of hardware, software or web applications. Based on this criterion, the IT help desk reuses only a portion of the three ontologies that include the concept web application error and its subclasses derived from the IT help desk of University B, the concept product and its subclasses derived from the IT help desk of University C and the concept Microsoft knowledge and its subclasses derived from IT Solution Provider XYZ (see Figure 2). In the ontology development process, the IT

help desk of University D can reuse not only the ontologies of other organizations, but also their inter-organizational knowledge associated as instances of those ontologies. As illustrated in Figure 2, the IT knowledge (instance) described using concept Office, Excel and create Vlookup can be captured from the knowledge base of IT Solution Provider XYZ and stored in the knowledge base of University D. This integrated ontology created by the help desk of University D has an additional function. By establishing dedicated mappings between integrated ontology and its ontology providers (that is, University B and C as well as IT Solution Provider XYZ), the associated knowledge captured in the knowledge base of University D can be automatically updated as long as there is a revised version generated from the ontology providers. In this case, whenever the knowledge (create VLookup) undergoes a revision in the knowledge evaluation process, the revised knowledge will not only be stored in the knowledge base of IT Solution Provider XYZ, it will also be broadcasted to other KMS through the dedicated mappings that include the knowledge base of University D. To allow general users to retrieve and use inter-organizational knowledge, organizations are required to establish mappings between its own ontology and ontologies of other organizations in this network. As shown in Figure 3, each solid line represents a mapping between a pair of concepts that belong to two different ontologies. Making use of string-based and linguistic resources matching techniques, two similar concepts from the ontologies of University A and IT Solution

Provider XYZ are mapped with each other, for instance, two semantically identical concepts, Office and Ms Office Problem, from the ontologies of University A and IT Solution Provider XYZ are mapped together.

In Figure 3, a user is searching for IT knowledge by choosing right options from problem type, software problem, application software and Microsoft Office type drop-down list on the user interface of the KMS of University A. Since there is no relevant knowledge stored in the KMS that can satisfy user's criteria, the system begins to search other KMSs including IT Solution Provider XYZ. The mappings allow the KMS of IT Solution Provider XYZ to understand incoming requests, for example, the options chosen in application software and Microsoft Office type drop-down list are semantically identical to Office and Excel concept in IT Solution Provider XYZ. The chosen options also trigger the ontology of IT Solution Provider XYZ to populate problem symptom drop-down list with concept create VLookup, create macro and create function. As long as the requested knowledge is available in the knowledge base of IT Solution Provider XYZ (in this case, it is the knowledge on how to create VLookup), it will be delivered to the user interface of University A. Subsequently, the knowledge will be displayed as if it is retrieved from its own knowledge base. In other words, the entire inter-organizational knowledge retrieval and displaying mechanism are performed in a "black box" manner.

Conclusion

Organizations are not capable of reusing inter-organizational knowledge even though the required knowledge is available in knowledge bases of other organizations because the organizational based KM approaches are designed for managing organizational knowledge only. An ontology-based collaborative inter-organizational KM network is proposed to solve the problems. A selection framework is also proposed to assist organizations in choosing suitable ontology mediation approaches during the establishment of the KM network, ranging from mapping approaches, levels of automation, mediation methods to matching techniques. The knowledge reusability and mismatches reconcilability of ontology and its related mediation methods enable organizational KMSs to understand the incoming request and the return knowledge, thus making it possible for them to collaborate and communicate with each other. By annotating knowledge explicitly in the form of machine process-able representation, organizations within the network can access, retrieve and reuse domain specific inter-organizational knowledge to support the five stages of organizational KM process. While knowledge engineers could reuse inter-organizational knowledge to create and evaluate organizational knowledge, general users are benefit from the effectiveness and efficiency in searching for relevant inter-organizational knowledge within the network.

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A PORTFOLIO SELECTION PROBLEM FOR UNCERTAIN MARKETS

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ABSTRACT

This paper studies a portfolio selection problem for uncertain markets via uncertainty theory. It first introduces a multi-factor stock model in uncertain market by means of uncertain differential equations. Then a portfolio selection problem is derived and some numerical examples are illustrated. Finally, some remarks are made in the concluding section.

Keywords: uncertainty theory, uncertain process, finance, portfolio selection

1 INSTRUCTIONS

Randomness and fuzziness have been used to describe undetermined properties for a long time. However, a lot of surveys showed that some imprecise quantities, such as information and knowledge represented by human language, behave neither like randomness nor fuzziness. In order to model these imprecise quantities, uncertainty theory was founded by Liu [5] in 2007 and refined by Liu [9] in 2010 based on normality, self-duality, countable subadditivity, and product measure axioms. A number of researchers have continued in this area. Gao [3] showed some properties of continuous uncertain measure. You [18] proved some convergence theorems of uncertain sequences. Liu and Ha [13] gave the expected value of function of uncertain variables. In order to collect and interpret expert's experimental data via uncertainty theory, Liu [9] introduced a questionnaire survey and proposed uncertain statistics for determining uncertainty distributions.

With the development of uncertainty theory, Liu [7] proposed uncertain programming which is essentially a type of mathematical programming involving uncertain variables. Besides, Liu [11] introduced uncertain risk analysis and reliability analysis to deal with system risk and reliability via uncertainty theory. Moreover, Liu [12] proposed uncertain logic to model human language via uncertain set. In order to derive consequences from uncertain knowledge or evidence, Liu [10] introduced uncertain inference and proposed the first inference rule, then Gao, Gao and Ralescu [4] extended the inference rule to the case with multiple antecedents and with multiple if-then rules.

In order to study the evolution of uncertain phenomena with time, Liu [6] introduced a concept of uncertain process in 2008, and Liu [8] designed a canonical process in 2009. In addition,

Liu [8] invented uncertain calculus to deal with differentiation and integration of function of uncertain processes, and Liu [6] defined uncertain differential equation. After that, Chen [1] gave an existence and uniqueness theorem for uncertain differential equations. By means of uncertain differential equation, Liu [8] proposed an uncertain stock model and derived European option pricing formulas. Following that, Chen [2] derived American option pricing formulas. Moreover, Peng and Yao [15] presented a stock model with meanreverting process, and Liu and Chen [14] presented a currency model with uncertain exchange rate. In addition, Zhu [19] presented uncertain optional control by means of uncertain differential equations.

In this paper, we will study a portfolio selection problem for a multi-factor stock model and turn it into a determined programming. The remainder of this paper is structured as follows. The next section is intended to introduce some concepts of uncertain process and uncertain differential equation. A portfolio selection problem will be presented and solved in Section 3. A numerical example will also be illustrated. Finally, some remarks are made in Section 4.

2 PRELIMINARY

In this section, we will introduce some useful definitions about uncertain process and uncertain differential equation. Uncertain process was defined by Liu [6] as a sequence of uncertain variables indexed by time or space.

Definition 1. (Liu [6]) Let T be an index set and (Γ, L, M) be an uncertainty space. An uncertain process is a measurable function from $T \times (\Gamma, L, M)$ to the set of real numbers, i.e., for each $t \in T$ and any Borel set B of real numbers, the set

$$\{X_t \in B\} = \{\gamma \mid X_t(\gamma) \in B\}$$

is an event.

Definition 2. (Liu [8]) An uncertain process C_t is said to be a canonical process if

- (i) $C_0 = 0$ and almost all sample paths are Lipschitz continuous,
- (ii) C_t has stationary and independent increments,
- (iii) every increment $C_{s+t} - C_s$ is a normally distributed uncertain variable with expected value 0 and variance t^2 , whose uncertainty distribution is

$$\Phi(x) = \left(1 + \exp\left(-\frac{\pi x}{\sqrt{3t}}\right) \right)^{-1}, \quad x \in \mathbb{R}.$$

If C_t is a canonical process, then the uncertain process

$$G_t = \exp(et + \sigma C_t)$$

is called a geometric canonical process with an uncertainty distribution

$$\Phi(x) = \left(1 + \exp\left(\frac{\pi(et - \ln x)}{\sqrt{3}\sigma t}\right) \right)^{-1},$$

where e is called the log-drift and σ is called the log-diffusion. Yao [17] proved that

$$E[G_t] = \begin{cases} \sqrt{3}\sigma t \exp(et) \csc(\sqrt{3}\sigma t), & \text{if } \sigma t < \pi / \sqrt{3} \\ +\infty, & \text{otherwise.} \end{cases}$$

Definition 3. (Liu [8]) Let X_t be an uncertain process and C_t be a canonical process. For any partition of closed interval $[a, b]$ with $a = t_1 < t_2 < \dots < t_{k+1} = b$, the mesh is written as

$$\Delta = \max_{1 \leq i \leq k} |t_{i+1} - t_i|.$$

Then the uncertain integral of X_t with respect to C_t is

$$\int_a^b X_t dC_t = \lim_{\Delta \rightarrow 0} \sum_{i=1}^k X_{t_i} \cdot (C_{t_{i+1}} - C_{t_i})$$

provided that the limit exists almost surely and is finite.

Liu [9] proved that, given a deterministic and integrable function $f(t)$, the uncertain integral

$$\int_0^s f(t) dC_t$$

is a normal uncertain variable at each time s , i.e.,

$$\int_0^s f(t) dC_t \sim N\left(0, \int_0^s |f(t)| dt\right).$$

Definition 4. (Liu [8]) Suppose C_t is a canonical process, and f and g are some given functions. Then

$$dX_t = f(t, X_t)dt + g(t, X_t)dC_t$$

is called an uncertain differential equation.

Let X_t be the bond price, and Y_t the stock price. Assume that the stock price follows a geometric canonical process. Then Liu's stock model [8] is written as follows,

$$\begin{cases} dX_t = rX_t dt \\ dY_t = eY_t dt + \sigma Y_t dC_t \end{cases}$$

where r is the riskless interest rate, e is the stock drift, and σ is the stock diffusion, and C_t is a canonical process. Liu [8] gave European option pricing formulas for Liu's stock model, and Chen [2] gave American option pricing formulas.

Assume that there are multiple stocks whose prices are determined by multiple canonical process. For this case, we have a multi-factor stock model in which the bond price X_t and the stock price Y_{it} are determined by

$$\begin{cases} dX_t = rX_t dt \\ dY_{it} = e_i Y_{it} dt + \sum_{j=1}^n \sigma_{ij} Y_{it} dC_{jt}, \quad i = 1, 2, \dots, m \end{cases} \quad (1)$$

where r is the riskless interest rate, e_i are the stock drift coefficients, σ_{ij} are the stock diffusion coefficients, C_{jt} are independent canonical process, $i = 1, 2, \dots, m, j = 1, 2, \dots, n$.

3 PORTFOLIO SELECTION

In this section, we will present a portfolio selection problem, and turn it into a determined programming model under some condition.

For the stock model (1), we have the choice of $m+1$ different investments. At each instant t , we may choose a portfolio $(\beta_t, \beta_{1t}, \dots, \beta_{mt})$ (i.e., the investment fractions meeting $\beta_t + \beta_{1t} + \dots + \beta_{mt} = 1$). Then the wealth Z_t at time t should follow the uncertain differential equation

$$dZ_t = r\beta_t Z_t dt + \sum_{i=1}^m e_i \beta_{it} Z_t dt + \sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \beta_{it} Z_t dC_{jt}. \quad (2)$$

Portfolio selection problem is to find an optimal portfolio $(\beta_t, \beta_{1t}, \dots, \beta_{mt})$ such that the expected wealth $E[Z_s]$ is maximized.

Theorem 1. Assume that an uncertain process Z_t follows the uncertain differential equation (2). Then Z_s is a lognormal uncertain variable

$$\text{LOGN} \left(\ln Z_0 + r \int_0^s \beta_t dt + \sum_{i=1}^m e_i \int_0^s \beta_{it} dt, \sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dt \right)$$

at each time s , i.e., Z_s has an uncertainty distribution

$$\Phi(x) = \left(1 + \exp \left(\frac{\pi \left(\ln Z_0 + r \int_0^s \beta_t dt + \sum_{i=1}^m e_i \int_0^s \beta_{it} dt - \ln x \right)}{\sqrt{3} \sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dt} \right) \right)^{-1} \quad x \in \mathfrak{R}.$$

Proof: It follows from the uncertain differential equation (2) that

$$\frac{dZ_t}{Z_t} = r\beta_t dt + \sum_{i=1}^m e_i \beta_{it} dt + \sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \beta_{it} dC_{jt}.$$

Integration on both sides yields

$$\begin{aligned} \ln Z_s - \ln Z_0 &= r \int_0^s \beta_t dt \\ &+ \sum_{i=1}^m e_i \int_0^s \beta_{it} dt + \sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dC_{jt}, \end{aligned}$$

which means

$$\begin{aligned} Z_s &= Z_0 \exp \left(r \int_0^s \beta_t dt + \sum_{i=1}^m e_i \int_0^s \beta_{it} dt + \sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dC_{jt} \right) \\ &= Z_0 \exp \left(r \int_0^s \beta_t dt + \sum_{i=1}^m e_i \int_0^s \beta_{it} dt \right) \exp \left(\sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dC_{jt} \right). \end{aligned}$$

Thus we have

$$\begin{aligned}
\Phi(x) &= M\{Z_s \leq x\} \\
&= M\left\{Z_0 \exp\left(r \int_0^s \beta_t dt + \sum_{i=1}^m e_i \int_0^s \beta_{it} dt\right) \right. \\
&\quad \left. \exp\left(\sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dC_{jt}\right) \leq x\right\} \\
&= M\left\{\sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dC_{jt} \leq \ln x \right. \\
&\quad \left. - \ln Z_0 - r \int_0^s \beta_t dt - \sum_{i=1}^m e_i \int_0^s \beta_{it} dt\right\} \\
&= \bigwedge_{j=1}^n M\left\{\sum_{i=1}^m \sigma_{ij} \int_0^s \beta_{it} dC_{jt} \leq \frac{\sum_{i=1}^m \sigma_{ij} \int_0^s \beta_{it} dt}{\sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dt} \right. \\
&\quad \left. \times \left(\ln x - \ln Z_0 - r \int_0^s \beta_t dt - \sum_{i=1}^m e_i \int_0^s \beta_{it} dt\right)\right\} \\
&= \left(1 + \exp\left(\frac{\pi \left(\ln Z_0 + r \int_0^s \beta_t dt + \sum_{i=1}^m e_i \int_0^s \beta_{it} dt - \ln x\right)}{\sqrt{3} \sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dt}\right)\right)^{-1}.
\end{aligned}$$

The theorem is verified.

From the above theorem, we know

$$\begin{aligned}
E[Z_s] &= \sqrt{3} Z_0 \sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dt \\
&\quad \times \exp\left(r \int_0^s \beta_t dt + \sum_{i=1}^m e_i \int_0^s \beta_{it} dt\right) \csc\left(\sqrt{3} \sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dt\right)
\end{aligned}$$

provided that

$$\sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dt \leq \frac{\pi}{\sqrt{3}}. \quad (3)$$

So given the condition (3) the portfolio selection problem turns into a determined programming model

$$\begin{cases}
\max E[Z_s] = \sqrt{3} Z_0 \sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dt \\
\times \exp\left(r \int_0^s \beta_t dt + \sum_{i=1}^m e_i \int_0^s \beta_{it} dt\right) \csc\left(\sqrt{3} \sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dt\right) \\
\text{subject to:} \\
\beta_t + \beta_{1t} + \dots + \beta_{mt} = 1, \quad s \in (0, s).
\end{cases} \quad (4)$$

This model can also be written as follows,

$$\begin{cases}
\max E[Z_t] = \sqrt{3} Z_0 \sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dt \\
\times \exp\left(r \int_0^s \beta_t dt + \sum_{i=1}^m e_i \int_0^s \beta_{it} dt\right) \csc\left(\sqrt{3} \sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dt\right) \\
\text{subject to:} \\
\beta_t + \beta_{1t} + \dots + \beta_{mt} = 1, \quad s \in (0, s) \\
\sum_{i=1}^m \sum_{j=1}^n \sigma_{ij} \int_0^s \beta_{it} dt \leq \frac{\pi}{\sqrt{3}}.
\end{cases} \quad (5)$$

Example 1. Assume that there is only one stock, i.e., $m=1$. This stock is determined by

$$\begin{cases}
dX_t = rX_t dt \\
dY_{1t} = e_1 Y_{1t} dt + \sigma_{11} Y_{1t} dC_{1t}
\end{cases} \quad (6)$$

where r is the riskless interest rate, e_1 is the stock drift, and σ_{11} is the stock diffusion, and C_{1t} is a canonical process. In this case, the portfolio selection problem turns into the following programming problem,

$$\begin{cases}
\max E[Z_t] = \sqrt{3} Z_0 \sigma_{11} \int_0^s \beta_{1t} dt \\
\times \exp\left(r \int_0^s \beta_t dt + e_1 \int_0^s \beta_{1t} dt\right) \csc\left(\sqrt{3} \sigma_{11} \int_0^s \beta_{1t} dt\right) \\
\text{subject to:} \\
\beta_t + \beta_{1t} = 1, \quad t \in (0, s) \\
\sigma_{11} \int_0^s \beta_{1t} dt \leq \pi / \sqrt{3}.
\end{cases} \quad (7)$$

Example 2. Assume that there are two stocks, i.e., $m=2$. These stocks are determined by

$$\begin{cases}
dX_t = rX_t dt \\
dY_{1t} = e_1 Y_{1t} dt + \sigma_{11} Y_{1t} dC_{1t} + \sigma_{12} Y_{1t} dC_{2t} \\
dY_{2t} = e_2 Y_{2t} dt + \sigma_{21} Y_{2t} dC_{1t} + \sigma_{22} Y_{2t} dC_{2t}
\end{cases} \quad (8)$$

where r is the riskless interest rate, e_1 and e_2 are the stock drift, and $\sigma_{11}, \sigma_{12}, \sigma_{21}$ and σ_{22} are the stock diffusions, and C_{1t} and C_{2t} are canonical processes. In this case, the portfolio selection problem turns into the following programming problem,

$$\begin{cases}
\max E[Z_t] = \sqrt{3} Z_0 \sum_{i,j=1}^2 \sigma_{ij} \int_0^s \beta_{it} dt \\
\times \exp\left(r \int_0^s \beta_t dt + \sum_{i=1}^2 e_i \int_0^s \beta_{it} dt\right) \csc\left(\sqrt{3} \sum_{i,j=1}^2 \sigma_{ij} \int_0^s \beta_{it} dt\right) \\
\text{subject to:} \\
\beta_t + \beta_{1t} + \beta_{2t} = 1, \quad t \in (0, s) \\
\sum_{i,j=1}^2 \sigma_{ij} \int_0^s \beta_{it} dt \leq \pi / \sqrt{3}.
\end{cases}$$

4 CONCLUSION

In this paper, we investigated a portfolio selection problem for uncertain markets. Such a problem turned into a determined programming model. Besides, A numerical example was illustrated.

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KEY CHALLENGES OF DEVELOPMENT PROCESS OF BUILDING WEB-BASED BUSINESS APPLICATIONS

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ABSTRACT

World Wide Web benefits people by disseminating information limitless for various reasons. Web-based business applications as platform used greatly for communication between people and businesses. Thus, web developers facing some challenges throughout web-based business applications development include its processes to conform business excel. This paper examine the results of a research exercise involving comprehensive literature studies and other relevant information analysis, which aims to discover the key challenges during the development of web-based business applications. Such key challenges may consider important for web developers to building better web-based business applications.

Keywords: Web-based Business Application, Web Development Life Cycle, Key Challenges.

INTRODUCTION

Web-based business applications (WBA) also refer to web applications are widely used by many businesses striving to reach the acme of business success which generally refers to software applications present on the web that allows web users to obtain substantially complete access to these applications through a web browser [12]. These applications can be corporate sites or enterprise applications as well as shopping portals. Thus, in this research, both purely web-based and partially web-based software applications are considered. The demands of such applications allow businesses to explore better prospects or opportunities for themselves as well as for web development companies to enhance their services in developing these applications for customer satisfaction.

In developing these applications, the existing methodology – software or system development life cycle (SDLC), needs to be adapted and innovated to suit the nature of the web environment – a blend of web-based techniques [27]. This adaptation and innovation of development life cycle has raised the new term for development methodology that is web development life cycle (WDLC) [1]. This paper

therefore, discusses key challenges of development process in building web-based business applications in which there are certain special characteristics of WBA development.

The paper is organized as follows. Firstly, we provide background information about the development process of WBA; Secondly, we present and discuss the key challenges that linked to the development process of WBA. Finally, we describe our conclusion and further research.

RELATED WORK

Web-based business applications are extensively being used due to the fact that their special nature and characteristics differ from conventional applications. For example, capability of a web application runs in different web browsers can potentially provide accessibility to anyone anywhere at any time [10]. Additionally, it provides flexibility and convenience to people and also may be beneficial to organisations for expanding their businesses. Furthermore, the types of web-based business applications are becoming more sophisticated and new features are added to replace the use of desktop applications [2]. For example, Google online office applications (purely web-based) provide similar functions as Microsoft desktop-based office suite provides. It is also noteworthy to point out that many software systems are becoming web-enabled such as Microsoft SharePoint which offers a web front-end.

Although much of the research has been done in web design processes, there are more issues found for development processes, in particular within the stages of WDLC. Similarly, these issues can also be viewed in traditional SDLC because of its adoption in creating WDLC. However, as this research study is focus on the aspect of WBA development, WDLC method is taken into account to address many additional challenges in regards to the unique requirements of WBAs. It seems that having WDLC method as an approach to WBA development, will successfully build large-scale, complex web applications [4].

In developing a web-based business application, both technical and management aspects are

needed to ensure web developers use proper development techniques and meet business requirements [25]. As a web application grows in size and complexity, requirements gathered should be clear and understandable for all stakeholders. Skills, attitudes, knowledge and experiences from different stakeholders could influence the web development processes to be efficient [15]. The key challenges of development process of WBA are described further in this paper that may assist web developers in building better WBAs.

METHODOLOGY

The research methodology used in this study has three main activities which focus on discovering key challenges for improving the development process of WBA, as illustrated in Figure 1.

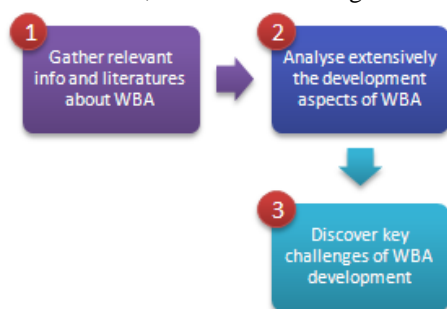


Figure 1: Research methodology

The research first has to gather intuition and relevant literature about WBA from published journals and conference papers. Next, from the collected information and literature, the analysis took place extensively to search for development challenges. Then, the key challenges of building WBA are discovered for web developers to know what they are facing when building WBAs.

DEVELOPMENT PROCESS

A number of development methodologies has been used for building web-based business applications which consists of several stages with particular activities that need to undertake. Extensive literatures about web-based development processes indicate that Abou-Zahra's [1] development life cycle (refer to Figure 2) is the most applicable and its generic processes are capable to develop a range of web applications. These development life cycles adapts ISO 12207 Software Life Cycle Processes for web-based application development and therefore chosen as a lead model to collect more information about WBA development.

Requirements Stage

Collecting data and requirements from clients and analyse them are the main activities in this stage. As the nature of web environment, considerations on who would the users like which may be

limitless but unlike the conventional software applications that have limits number of users who access those applications. The relevant content and appropriate languages used in the applications need to be taken into account prior to approval or sign-off requirements which is all depends on what to be developed and whom to develop for [14].

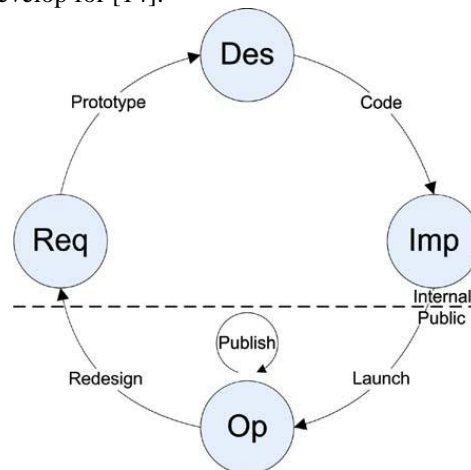


Figure 2: Web development life cycle [1]

Design Stage

High-level and low-level design and technical specification requirements are prepared in this stage. It includes interface design, database structure, architecture design, navigation flow and pluralistic design [14]. Next, prototype is created in this stage to conform the requirements from the clients. Design activities will be frequently updates until the clients are satisfied to the design and mock application before the actual development takes place.

Implementation Stage

This stage is where the actual web-based business applications are start to develop. Web characteristics and uniqueness should be concerned throughout the development to ensure the WBA meet the target audience intention to use. The development activities also involve application testing to test the module for functionally working as a complete application. Testing WBA with multiple browsers [5] is important for application compatibility as well as the convenience of web users in using their own preferable browser. At the end of this stage, the web-based business applications are tested with error free and ready to be moved into production or simply go live.

Operation Stage

This stage consists of two major activities. First, publish the completed web-based business applications and second, maintain that applications. Publishing is where the WBA resides in the web server for accessibility either

hosted at web hosting company or at client's own site [21]. Search Engine Optimisation or SEO can be applied to organisations for top ranked web search results [20]. To ensure the application is well-maintained, evaluation activities will take place and later implement relevant improvement or changes where necessary according to what has been decided.

KEY CHALLENGES

In doing business, the web-based business applications as communication platform, are significant to the organisations to disseminate and distribute timely information across a global organisations. From the comprehensive literature, it was found that there is a number of key challenges need to be taken into consideration by web developers when developing web-based business application [6]. It covers from beginning of the early development until completed applications. The key challenges presented here (see Figure 3) are among the most significant which is based on the nature and characteristic of web-based application, but not limited to.

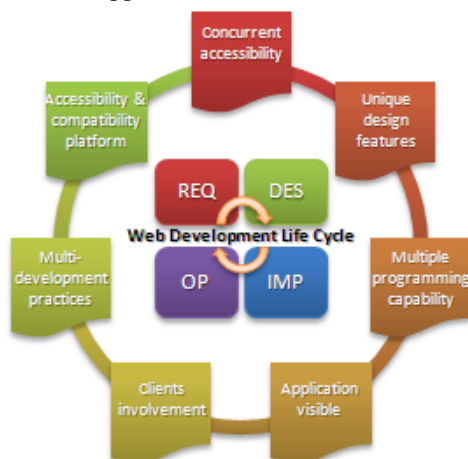


Figure 3: Key challenges of WBA development

Concurrent Accessibility

Conventional software applications have a certain users which is very specific within a set of boundaries, divisions or organisations [23]. It is determined at the earlier stage during the analysis of development requirements. If access to the software application involves a small number of users, the development of such application to provide the concurrent accessibility is seems practical but for a huge number of users globally, this is where the web-based business applications are developed for.

The users for WBA can be from a wide range of groups, either locally or globally with different background include social, cultural and languages [26][22]. Unlimited boundaries with unlimited web users can be considered one of the key challenges in building WBA for global access

concurrently to effectively reach the target market and achieve business objectives [16].

Unique Design Features

Creating the design features for a conventional software application is usually depends on the project specification and its objectives. Most of the design layouts are consistent with strict navigation use [14]. Even it is the same for building WBA which design according to specifications; the design features in web context are more dynamic and flexible. The key challenge is that it plays an important role in attracting more users and engaging more clients for seizing business opportunities. As there are many competitors outside the globe with their WBA placed on the Internet, the design features when building WBA should be more competitive and compelling [14].

A well site-navigated of WBA benefits web users to obtain desired information in faster and easier way [11][8][28]. Furthermore, the web developers should concern not only with the information content, but the attractiveness, pluralistic design of WBA and valid hyperlinks for effective navigation [14].

Multiple Programming Capability

In conventional software development, the number of the programming language use is very small. A focus to a single or two types of programming language is seems much easier and if mastered, might lead the developer to become an expert. Object-oriented methods, languages and CASE tools might be required for best practices for developing software application [14].

However, the key challenge in building WBA is that the web developers should have the capability to well-verse with a quite number of programming languages and platforms [14]. This is because WBA can be accessed via various platforms that require proper programming languages so that WBA can perform effectively. It applies client-side and server-side architecture that involves interaction between front-end and back-end component [7]. In addition, as web technologies are rapidly grow, web developers should also have the capabilities of learning new languages to cope with the current technologies [24].

Application Visible

The conventional software application can only be visible to the people who use that application because the application is setup and install on site. The development for such application is very specific and visible to the users who owns it or use

it for a particular purpose [23]. For example, an organisation provides a time management system where its employees can keep a track of the time. This means the system is visible only to the employees of that organisation.

Unlike web-based business applications that are develop purposely to make it visible worldwide. It does not mean that if the application can be accessed globally, it also can be visible too. This is one of the key challenges for web developers to make the WBA visible to users who search for a particular term and relevant WBAs appear on the search result. To achieve this, there is one technique namely search engine optimisation (SEO) [20] that help businesses to be on the top of web searched result. An example of a business that sells personal computer online, those organisations's business will be listed on the first list of the searched result when a web user searches for a personal computer by using keywords or phrases in meta-tags and relevance of links from external sites to target site [13][20]. Moreover, if the WBA need to be updated after changes or improvement been made, the actions can be done remotely with authentication elements.

Clients Involvement

Principally, during the conventional software development, the clients' involvement is only at certain stages of SDLC such as during requirements gathering, during requirements analysis and during testing activities only. The clients does not involve with rest of SDLC stages. But, if there is changes in the requirements and if the development has already started, the developer somehow needs to go back to the requirements gathering and analysis stage to update the requirements and then necessary codes need to change according to new specifications [23].

This is different to web-based business development where the clients involvement is at each stage of WDLC. The clients provide feedback on the scope, clarification of the requirements [17][19] and ultimately the clients make all the decision whether the development of WBA needs to proceed. The feedbacks are normally the change request where small development iteration within each stage of WDLC is perform to tackle problems until WBA is complete [23]. At the end of the day, this would produce more effective and accurate applications. Having close involvement with clients are important for gaining their immediate feedback and clarification throughout the building of WBAs but then the communications with clients is one of the key challenges where dealing with

clients is a very difficult task.

Multi-Development Practices

Developers in conventional software development have a specific job and the focus is usually on one software application to develop as well as belong to a specific stage of SDLC [23]. For example, a designer is designing a user interface of a software application at the design stage. Whereas, web developers that build WBA face a great challenge which they have given a number of web projects to build and it is not necessary belong to a specific stage of WDLC when building WBA but across the development process [19]. The reason for this is that when building WBA, the functions, modules or components can be reuse and able to customise easily which allow faster development of WBA.

Accessibility and Compatibility Platform

A conventional software application has its own platform to access it which develops uniquely based on requirement specifications. Normally, the platform is a windows-like interface for user to access it and it is develop according to where the application resides [21]. For example, if the software application is windows-based than the user interface is developed for windows and there is compatibility issue with other platform such as Mac and Linux.

Unlike software application, WBA is built on the Internet platform which is compatible with all operating system platforms. This is because the only platform to access WBA is through a web browser. There is a number of web browsers available such as Internet Explorer and Mozilla Firefox. Thus, the key challenge for building WBA is to cater multiple web browsers that allow WBA to be accessed in various web browsers if not all, the famous ones [18]. This means simply that WBA should be compatible to be accessed in different web browsers. The reason is that each web user has its own preferable of using web browsers [5][3].

CONCLUSION

Web-based business applications as platform used greatly for communication between people and business. This paper discovers WBA development key challenges through comprehensive literature about WBA development processes with adapted WDLC. Four WDLC stages for WBA that should be followed are; requirements, design, implementation and operation. Based on the identified WBA development processes according to the WDLC stages, we found that there are six key challenges for building WBA for businesses namely; concurrent accessibility,

unique design features, multiple programming capability, clients involvement, application visible, multi-development practices and accessibility and compatibility platform.



Building effective web-based business applications is vital due to the appearance on the web which allow many web users easy to access as long as a computer has a web browser and an Internet connection. This may affect the performance and user experience in using or accessing these applications and the key challenges presented in this paper therefore, are important for web developers to consider to build better web-based business applications. Further study is required to identify issues faced by web developers specifically and web development team generally, in terms of information management and quality aspects of WBA development process.

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