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Enriching Global Business Practices

Edited by:
Russell K. H. Ching
Johanna Tommila
Beom-Jin Choi
Gwanhoo Lee

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Electronic Business

“Enriching Global Business Practices”

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Preface

The Waikīloa Beach Marriott Resort and Spa on the Big Island of Hawai‘i is the site of the eighth International Conference on Electronic Business. Often called the melting pot of the Pacific, Hawai‘i was appropriately chosen to bring together researchers and scholars from different parts of the world to share and exchange their knowledge and ideas to enrich global business practices. In keeping with the tradition of presenting a premier global forum for the sharing and exchange of knowledge and ideas set by prior ICEB conferences, ICEB 2008 brought together scholars, researchers and practitioners from the far reaches of the globe, including Asia, Australia, the Caribbean, Europe, the Middle East and North America, as well as locally in Hawai‘i.

The papers and abstracts presented in this proceedings span a wide spectrum of topics. They include concept papers, case studies and empirical research studies. The advanced topics reflect the evolution of e-business practices that has been led by advances in information technology. As we approach the beginning of the second decade of the twenty-first century, the globalization of e-business is no longer a dream or far reaching vision, but the generally accepted business model for conducting business.

The conference organizers extend a deep appreciation to the conference’s sponsors: the College of Business Administration, California State University, Sacramento; the College of Business and Economics, University of Hawai‘i at Hilo; IBM; and the Waikīloa Beach Marriott Resort and Spa. Their support ensured the success of this conference.

Russell K.H. Ching
ICEB 2008 Conference Chair
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Identifying Success Factors for Developing Web Applications: A Research Report

Monica Lam, California State University, Sacramento, USA, lamsm@csus.edu

Abstract

A survey for success factors of Web application development reveals that development methodologies, tools, and techniques are not considered as important by developers for the success of Web application development. Rapid application prototyping, ERD (entity relationship diagram), program flowchart, and application framework are more highly regarded than the object-oriented tools such as use case diagram, class diagram, object diagram, and sequence diagram. Developers focus more on maintainability and scalability than end users and management for evaluating the success of Web application development. Ambiguous user requirements, scope creeping, and lack of success metrics are evaluated as the most important issues for the failure of Web application development. Research results also indicate that developers need more help in communication, management, and control than the technology aspects of the development process. The overall findings point to flexible, simple, proven, participative, and management-oriented methodologies, tools, and techniques to address ambiguous and changing user requirements in the next generation development approaches for Web applications.

Keywords: Web Application Development, Documentation Tool

1. Introduction: Research Questions and Significance

This research project defines a Web application as a software system that relies on the Web as its interaction medium with the end users to create, exchange, and modify data for transaction requirements. The survey was designed to identify the methodologies, techniques, and tools which are frequently used by practitioners to develop Web applications. The goal is to determine whether methodologies, techniques, and tools affect the success of Web application development. Given practitioners’ feedback and comments, the investigator will attempt to modify existing methodologies, techniques, and tools or develop new ones that can overcome existing development problems, in order to facilitate Web application success.

Methodologies for application development are defined as the step-by-step procedures to carry out the development activities consisting of different phases in a system development life cycle. A methodology has its own assumptions about the reality that affect how it divides a development cycle into different tasks, has its own techniques to support working principles and enforce discipline, and has its own tools to generate the deliverables for activities. In other words, there are a collection of corresponding techniques and tools for a certain development methodology.

As Web application development is different from traditional information system development in terms of user participation, user environment, communication control, testing requirements, and functionality design, existing methodologies for information system development may not well suit Web applications. Web application development has well passed its introduction phase in a technology adoption life cycle. A survey of the literature reveals that although many methodologies for Web application development have been suggested, they have not been consolidated into a few proven, effective, and valid approaches for Web developers. Web developers still more or less rely on their own experience and preferences to select the methods and tools to accomplish their missions. It is in this proliferation phase of the Web technology adoption cycle that we need to determine what works and what does not and why.

2. Literature Review

The literature for development life cycle, documentation tools, special issues such as security and accessibility, and Web services as imported components in a Web application are summarized in Tables A and B.
Table A. Research Results for the Direction of Development Life Cycle

<table>
<thead>
<tr>
<th>Studies</th>
<th>Research Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>[22] Taylor 2001</td>
<td>The research has case studies for 20 UK organizations regarding technical, analytical, and business skills and knowledge required for Web developers. None of the IT practitioners interviewed within the 20 organizations mentioned academic literature or standard bodies as a source of knowledge.</td>
</tr>
</tbody>
</table>

Table B. Research Results for the Directions of Documentation Tools, Special Issues, and Web Services

<table>
<thead>
<tr>
<th>Studies</th>
<th>Research Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Documentation Tools</td>
<td>This research direction focuses on adapting UML (Unified Modeling Language) as a documentation tool to Web application development. As UML was not originally designed to satisfy the modeling needs for Web applications, the adaptation process relies on the stereotyped class in UML to represent the unique elements in Web applications. While UML seems to emerge as a popular documentation tool for Web applications, there are still ongoing works to enhance UML for Web purposes.</td>
</tr>
<tr>
<td>Special Issues</td>
<td>This research direction discusses different special issues for Web application development such as accessibility needs for handicapped users, security, and operational concerns for transactional Web applications. It was stressed that those special concerns must be designed into the applications at early stages of the development life cycle.</td>
</tr>
<tr>
<td>Web Services</td>
<td>XML (Extensible Markup Language) Web services are considered as one of the important technical challenges and business opportunities for Web applications in the future. The issues include computing platforms, payment structure, copyrights, integration, confidentiality, and customization.</td>
</tr>
</tbody>
</table>

3. Research Methodology

The preliminary questionnaire was submitted to ten Web developers for pretest. Feedback from pretest was used to revise the questionnaire in terms of meaning clarification, format, ordering of questions, and addition of questions. The questionnaire was administered by an Internet survey company in a period of 4 weeks. There were one initial invitation email and one follow-up reminder email to potential participants. The survey sample of potential participants include Chief Computing Architect, CIO, VP for eBiz/Internet, VP for IT, VP for Network, VP for Quality Assurance, VP for Software Development, Director for eBiz/Internet, Director for IT, Director for Network, Director for Software Development, Manager for Quality Assurance, and Chief Technology Officer. The initial collection of responses was filtered using a reliability test based on multiple pairs of variables in the survey. The reliability test generated a total of 254 valid responses for the analysis phase. The remaining of this research report consists of descriptive statistics of variables, factor analysis results, interpretation of research results, and conclusion.

4. Descriptive Statistics of Variables

This section reports the descriptive statistics of some significant variables in the survey.
Table 1. What is your company type?

<table>
<thead>
<tr>
<th>Company Type</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-national company</td>
<td>25</td>
</tr>
<tr>
<td>Public limited company</td>
<td>7</td>
</tr>
<tr>
<td>Small/medium enterprise</td>
<td>53</td>
</tr>
<tr>
<td>Federal or state government type</td>
<td>3</td>
</tr>
<tr>
<td>Others</td>
<td>12</td>
</tr>
</tbody>
</table>

Table 2. How important are the following end users’ feedback for evaluating the success of Web application development in your organization?

<table>
<thead>
<tr>
<th>Code</th>
<th>Evaluation Factor</th>
<th>Very Important %</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU1</td>
<td>End users’ feedback about functionality</td>
<td>64.9</td>
</tr>
<tr>
<td>EU2</td>
<td>End users’ feedback about navigation</td>
<td>44.9</td>
</tr>
<tr>
<td>EU3</td>
<td>End users’ feedback about usability/user friendliness</td>
<td>57.1</td>
</tr>
<tr>
<td>EU4</td>
<td>End users’ feedback about security</td>
<td>24.9</td>
</tr>
<tr>
<td>EU5</td>
<td>End users’ feedback about visual/audio/aesthetic characteristics</td>
<td>26.1</td>
</tr>
</tbody>
</table>

Table 3. How important are the following development team members’ feedback for evaluating the success of Web application development in your organization?

<table>
<thead>
<tr>
<th>Code</th>
<th>Evaluation Factor</th>
<th>Very Important %</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM1</td>
<td>development team members’ feedback about functionality</td>
<td>26.9</td>
</tr>
<tr>
<td>TM2</td>
<td>development team members’ feedback about navigation</td>
<td>17.1</td>
</tr>
<tr>
<td>TM3</td>
<td>development team members’ feedback about easiness to interact with</td>
<td>16.7</td>
</tr>
<tr>
<td>TM4</td>
<td>development team members’ feedback about security features</td>
<td>55.1</td>
</tr>
<tr>
<td>TM5</td>
<td>development team members’ feedback about visual/audio/aesthetic characteristics</td>
<td>12.2</td>
</tr>
<tr>
<td>TM6</td>
<td>development team members’ feedback about suitability of development methodology</td>
<td>31.8</td>
</tr>
<tr>
<td>TM7</td>
<td>development team members’ feedback about suitability of development tools and techniques</td>
<td>37.6</td>
</tr>
<tr>
<td>TM8</td>
<td>development team members’ feedback about how well the system performs required tasks</td>
<td>35.9</td>
</tr>
<tr>
<td>TM9</td>
<td>development team members’ feedback about system maintainability</td>
<td>44.1</td>
</tr>
<tr>
<td>TM10</td>
<td>development team members’ feedback about system scalability</td>
<td>41.2</td>
</tr>
</tbody>
</table>

Table 4. How important are the following overall criteria for evaluating the success of Web application development in your organization?

<table>
<thead>
<tr>
<th>Code</th>
<th>Evaluation Factor</th>
<th>Very Important %</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC1</td>
<td>Whether the application passes the cost/benefit threshold?</td>
<td>28.6</td>
</tr>
<tr>
<td>CC2</td>
<td>Whether the application is within the approved budget?</td>
<td>21.6</td>
</tr>
<tr>
<td>CC3</td>
<td>Whether the application can be delivered within the approved timeline?</td>
<td>26.1</td>
</tr>
<tr>
<td>CC4</td>
<td>Whether the application satisfies the business needs as expected?</td>
<td>66.9</td>
</tr>
<tr>
<td>CC5</td>
<td>Whether the application delivers the overall quality as expected?</td>
<td>41.2</td>
</tr>
<tr>
<td>CC6</td>
<td>Whether the application is maintainable?</td>
<td>28.6</td>
</tr>
<tr>
<td>CC7</td>
<td>Whether the application is scalable?</td>
<td>28.2</td>
</tr>
<tr>
<td>CC8</td>
<td>Whether different deliverables are on time?</td>
<td>17.1</td>
</tr>
</tbody>
</table>

Table 5. How do you attribute the following methodologies to the success of Web application development if they are used in your organization?

<table>
<thead>
<tr>
<th>Code</th>
<th>Methodology</th>
<th>Very Important %</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM1</td>
<td>Rational Unified Process</td>
<td>3</td>
</tr>
<tr>
<td>SM2</td>
<td>Extreme Programming</td>
<td>7</td>
</tr>
<tr>
<td>SM3</td>
<td>Rapid Application Prototyping</td>
<td>14</td>
</tr>
<tr>
<td>SM4</td>
<td>WebML (Web Modeling Language)</td>
<td>2</td>
</tr>
<tr>
<td>SM5</td>
<td>Waterfall System Development Life Cycle</td>
<td>4</td>
</tr>
<tr>
<td>SM6</td>
<td>Compuware's UNIFACE</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 6. How do you attribute the following development phases to the success of Web application development if they are used in your organization?

<table>
<thead>
<tr>
<th>Code</th>
<th>Development Phase</th>
<th>Very Important %</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP1</td>
<td>Creative Brief/Concept Creation</td>
<td>27.3</td>
</tr>
<tr>
<td>SP2</td>
<td>Functional/Technical/Operational Feasibility Studies</td>
<td>15.5</td>
</tr>
<tr>
<td>SP3</td>
<td>Cost/Benefit Analysis</td>
<td>9.4</td>
</tr>
<tr>
<td>SP4</td>
<td>Generation of Project Plan: Mission, Objectives, Targeted Users, Scope, Budget, Web Teams</td>
<td>24.9</td>
</tr>
<tr>
<td>SP5</td>
<td>Functionality Requirements</td>
<td>40</td>
</tr>
<tr>
<td>SP6</td>
<td>Data Storage and Access Design</td>
<td>17.1</td>
</tr>
<tr>
<td>SP7</td>
<td>Operations and Business Process Design</td>
<td>26.1</td>
</tr>
<tr>
<td>SP8</td>
<td>Navigation Design</td>
<td>18</td>
</tr>
<tr>
<td>SP9</td>
<td>Presentation/Page Layout Design</td>
<td>19.2</td>
</tr>
<tr>
<td>SP10</td>
<td>Page communication/relationship</td>
<td>11.4</td>
</tr>
<tr>
<td>SP11</td>
<td>Web service design</td>
<td>14.3</td>
</tr>
<tr>
<td>SP12</td>
<td>Component design</td>
<td>13.9</td>
</tr>
<tr>
<td>SP13</td>
<td>Infrastructure configuration</td>
<td>16.3</td>
</tr>
<tr>
<td>SP14</td>
<td>Technical specifications</td>
<td>29</td>
</tr>
<tr>
<td>SP15</td>
<td>Kickoff meeting to review functional and technical specifications</td>
<td>27.8</td>
</tr>
<tr>
<td>SP16</td>
<td>Application coding</td>
<td>29.4</td>
</tr>
<tr>
<td>SP17</td>
<td>Code review</td>
<td>18.4</td>
</tr>
<tr>
<td>SP18</td>
<td>Testing</td>
<td>47.3</td>
</tr>
<tr>
<td>SP19</td>
<td>Launch</td>
<td>31</td>
</tr>
</tbody>
</table>

Table 7. How do you attribute the following tools/techniques to the success of Web application development if they are used in your organization?

<table>
<thead>
<tr>
<th>Code</th>
<th>Development Tools/Techniques</th>
<th>Very Important %</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST1</td>
<td>Entity Relationship Diagrams (ERD)</td>
<td>13.5</td>
</tr>
<tr>
<td>ST2</td>
<td>Story Boarding</td>
<td>13.1</td>
</tr>
<tr>
<td>ST3</td>
<td>Use Case Diagrams</td>
<td>9.4</td>
</tr>
<tr>
<td>ST4</td>
<td>Class Diagrams</td>
<td>6.1</td>
</tr>
<tr>
<td>ST5</td>
<td>Object Diagrams</td>
<td>5.7</td>
</tr>
<tr>
<td>ST6</td>
<td>Sequence Diagrams</td>
<td>4.9</td>
</tr>
<tr>
<td>ST7</td>
<td>Collaboration Diagrams</td>
<td>2.9</td>
</tr>
<tr>
<td>ST8</td>
<td>Statechart Diagrams</td>
<td>2.4</td>
</tr>
<tr>
<td>ST9</td>
<td>Activity Diagrams</td>
<td>5.3</td>
</tr>
<tr>
<td>ST10</td>
<td>Component Diagrams</td>
<td>5.3</td>
</tr>
<tr>
<td>ST11</td>
<td>Deployment Diagrams</td>
<td>5.3</td>
</tr>
<tr>
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<td>Web Application Extension to Unified Modeling Language</td>
<td>3.7</td>
</tr>
<tr>
<td>ST13</td>
<td>Program Flowcharts</td>
<td>9.8</td>
</tr>
<tr>
<td>ST14</td>
<td>Decision Tables</td>
<td>5.3</td>
</tr>
<tr>
<td>ST15</td>
<td>Hierarchy-Input-Process-Output Charts (HIPO)</td>
<td>4.1</td>
</tr>
<tr>
<td>ST16</td>
<td>Pseudocode</td>
<td>5.3</td>
</tr>
<tr>
<td>ST17</td>
<td>Workflow Analysis</td>
<td>17.6</td>
</tr>
<tr>
<td>ST18</td>
<td>Review/Staging Web Site for Communication Purposes</td>
<td>20</td>
</tr>
<tr>
<td>ST19</td>
<td>Periodic and standardized Progress Reports</td>
<td>12.7</td>
</tr>
<tr>
<td>ST20</td>
<td>Project Management Software</td>
<td>12.2</td>
</tr>
<tr>
<td>ST21</td>
<td>Diagram Generation Software</td>
<td>5.3</td>
</tr>
<tr>
<td>ST22</td>
<td>Code Generation/Review/Testing Software</td>
<td>12.2</td>
</tr>
<tr>
<td>ST23</td>
<td>Application Framework</td>
<td>22.4</td>
</tr>
</tbody>
</table>
Table 8. How do you rate the importance of the following factors that drive the choices of methodologies, tools, and techniques for Web application development in your organization?

<table>
<thead>
<tr>
<th>Code</th>
<th>Adoption Factor</th>
<th>Very Important %</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF1</td>
<td>Improve overall quality of applications</td>
<td>37.1</td>
</tr>
<tr>
<td>AF2</td>
<td>Improve maintenance</td>
<td>29.4</td>
</tr>
<tr>
<td>AF3</td>
<td>Improve management of development process</td>
<td>17.1</td>
</tr>
<tr>
<td>AF4</td>
<td>Improve team member communication</td>
<td>20.8</td>
</tr>
<tr>
<td>AF5</td>
<td>Improve communication with end users</td>
<td>23.7</td>
</tr>
<tr>
<td>AF6</td>
<td>Reduce cost</td>
<td>22</td>
</tr>
<tr>
<td>AF7</td>
<td>Reduce development time</td>
<td>32.2</td>
</tr>
</tbody>
</table>

Table 9. How do you rate the importance of the following reasons for failure of Web application development in your organization?

<table>
<thead>
<tr>
<th>Code</th>
<th>Failure Factor</th>
<th>Very Important %</th>
</tr>
</thead>
<tbody>
<tr>
<td>FF1</td>
<td>Ambiguous user requirements from beginning</td>
<td>58</td>
</tr>
<tr>
<td>FF2</td>
<td>Ambiguous or lack of metrics for success</td>
<td>21.2</td>
</tr>
<tr>
<td>FF3</td>
<td>Scope creeping</td>
<td>42</td>
</tr>
<tr>
<td>FF4</td>
<td>Unacceptable/unsatisfactory quality</td>
<td>17.6</td>
</tr>
<tr>
<td>FF5</td>
<td>Lack of clear communication among team members</td>
<td>20.4</td>
</tr>
<tr>
<td>FF6</td>
<td>Lack of clear communication with end users</td>
<td>32.2</td>
</tr>
<tr>
<td>FF7</td>
<td>Lack of proper management control</td>
<td>22.4</td>
</tr>
<tr>
<td>FF8</td>
<td>Lack of clear roles and responsibilities</td>
<td>17.6</td>
</tr>
<tr>
<td>FF9</td>
<td>Lack of top management support</td>
<td>21.2</td>
</tr>
<tr>
<td>FF10</td>
<td>Inappropriate/incorrect methodologies</td>
<td>8.6</td>
</tr>
<tr>
<td>FF11</td>
<td>Inappropriate/incorrect tools/techniques</td>
<td>9.4</td>
</tr>
<tr>
<td>FF12</td>
<td>Political reasons</td>
<td>14.7</td>
</tr>
<tr>
<td>FF13</td>
<td>Insufficient manpower</td>
<td>27.8</td>
</tr>
<tr>
<td>FF14</td>
<td>Insufficient expertise</td>
<td>22.4</td>
</tr>
<tr>
<td>FF15</td>
<td>Insufficient time</td>
<td>30.2</td>
</tr>
<tr>
<td>FF16</td>
<td>Poor planning</td>
<td>21.6</td>
</tr>
<tr>
<td>FF17</td>
<td>Unresolved conflicts among team members</td>
<td>4.9</td>
</tr>
<tr>
<td>FF18</td>
<td>Unresolved conflicts with end users</td>
<td>8.2</td>
</tr>
</tbody>
</table>

5. Factor Analysis

Factor analysis is a statistics technique to reduce the number of variables for a concept by grouping them into different factors based on their distribution, variance, and contribution to the concept. This section shows explained variance for factors, factor matrix, and factor description from factor analysis for selected variables in the study. We adopted the factor analysis results from the extraction method of Maximum Likelihood and the factor rotation method of Varimax with Kaiser Normalization in SPSS. The rotation factor loadings generated more descriptive factors than the pre-rotation solutions. The cutoff threshold for selecting variables into a factor is a loading of not less than 0.5 in this study.

5.1 End Users' Feedback for Success Evaluation (EU1-EU5)

Table 10.1 Explained Variance for End Users' Feedback

<table>
<thead>
<tr>
<th>Factor</th>
<th>Initial Eigenvalues</th>
<th>Rotation Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% Variance of</td>
</tr>
<tr>
<td>1</td>
<td>3.034</td>
<td>60.687</td>
</tr>
<tr>
<td>2</td>
<td>.800</td>
<td>16.004</td>
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</table>
### Table 10.2  Factor Matrix for End Users' Feedback

<table>
<thead>
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<th>Factor</th>
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<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU3</td>
<td>.860</td>
<td>.248</td>
</tr>
<tr>
<td>EU2</td>
<td>.781</td>
<td>.345</td>
</tr>
<tr>
<td>EU1</td>
<td>.653</td>
<td>.313</td>
</tr>
<tr>
<td>EU4</td>
<td>.319</td>
<td>.294</td>
</tr>
<tr>
<td>EU5</td>
<td>.314</td>
<td>.949</td>
</tr>
</tbody>
</table>

### Table 10.3  Factor Descriptions for End Users' Feedback

<table>
<thead>
<tr>
<th>Factor</th>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>euF1</td>
<td>EU1, EU2, EU3</td>
<td>The what and how of Web applications as evaluated by end users</td>
</tr>
</tbody>
</table>

### 5.2 Development Team Members' Feedback for Success Evaluation (TM1-TM10)

### Table 11.1  Explained Variance for Team Members' Feedback

<table>
<thead>
<tr>
<th>Factor</th>
<th>Initial Eigenvalues</th>
<th>Rotation Sums of Squared Loadings</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
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<tr>
<td>1</td>
<td>4.522</td>
<td>45.224</td>
</tr>
<tr>
<td>2</td>
<td>1.881</td>
<td>18.807</td>
</tr>
<tr>
<td>3</td>
<td>.896</td>
<td>8.961</td>
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<tr>
<td>4</td>
<td>.687</td>
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<tr>
<td>5</td>
<td>.608</td>
<td>6.079</td>
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### Table 11.2  Factor Matrix for Team Members' Feedback

<table>
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<tr>
<th>Factor</th>
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<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM3</td>
<td>.917</td>
<td>.176</td>
<td>.078</td>
<td>.065</td>
<td>-.035</td>
</tr>
<tr>
<td>TM2</td>
<td>.849</td>
<td>.154</td>
<td>.099</td>
<td>.055</td>
<td>.156</td>
</tr>
<tr>
<td>TM5</td>
<td>.714</td>
<td>.118</td>
<td>.137</td>
<td>.174</td>
<td>-.091</td>
</tr>
<tr>
<td>TM1</td>
<td>.620</td>
<td>.069</td>
<td>.157</td>
<td>.098</td>
<td>.405</td>
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<tr>
<td>TM9</td>
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<td>.873</td>
<td>.189</td>
<td>.070</td>
<td>.063</td>
</tr>
<tr>
<td>TM10</td>
<td>.075</td>
<td>.733</td>
<td>.260</td>
<td>.251</td>
<td>-.172</td>
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<td>.274</td>
<td>.079</td>
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<td>.250</td>
<td>.954</td>
<td>.042</td>
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<td>.688</td>
<td>.169</td>
<td>.109</td>
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<td>.346</td>
<td>.149</td>
<td>.493</td>
<td>.045</td>
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### Table 11.3  Factor Descriptions for Team Members' Feedback

<table>
<thead>
<tr>
<th>Factor</th>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>tmF1</td>
<td>TM1, TM2, TM3, TM5</td>
<td>The what and how of Web applications as evaluated by team members</td>
</tr>
<tr>
<td>tmF2</td>
<td>TM8, TM9, TM10</td>
<td>The future of Web applications as evaluated by team members</td>
</tr>
<tr>
<td>tmF3</td>
<td>TM6, TM7</td>
<td>The development methodology, tools, and techniques as evaluated by team members</td>
</tr>
</tbody>
</table>
5.3 Organization's Overall Criteria for Success Evaluation (CC1-CC8)

Table 12.1 Explained Variance for Overall Criteria

<table>
<thead>
<tr>
<th>Factor</th>
<th>Initial Eigenvalues</th>
<th>Rotation Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
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<tr>
<td>2</td>
<td>1.488</td>
<td>18.596</td>
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<tr>
<td>3</td>
<td>.902</td>
<td>11.273</td>
</tr>
<tr>
<td>4</td>
<td>.640</td>
<td>8.006</td>
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</table>

Table 12.2 Factor Matrix for Overall Criteria

<table>
<thead>
<tr>
<th>Factor</th>
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<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC6</td>
<td>.943</td>
<td>.060</td>
<td>.189</td>
<td>.246</td>
</tr>
<tr>
<td>CC7</td>
<td>.676</td>
<td>.127</td>
<td>.100</td>
<td>.303</td>
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<tr>
<td>CC8</td>
<td>.168</td>
<td>.856</td>
<td>.166</td>
<td>.057</td>
</tr>
<tr>
<td>CC3</td>
<td>.008</td>
<td>.652</td>
<td>.265</td>
<td>.190</td>
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<td>CC2</td>
<td>.150</td>
<td>.303</td>
<td>.838</td>
<td>.075</td>
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<td>CC1</td>
<td>.127</td>
<td>.150</td>
<td>.637</td>
<td>.228</td>
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<td>CC5</td>
<td>.467</td>
<td>.110</td>
<td>.145</td>
<td>.683</td>
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<tr>
<td>CC4</td>
<td>.317</td>
<td>.193</td>
<td>.251</td>
<td>.640</td>
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</table>

Table 12.3 Factor Descriptions for Overall Criteria

<table>
<thead>
<tr>
<th>Factor</th>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ccF1</td>
<td>CC6, CC7</td>
<td>The future of Web applications</td>
</tr>
<tr>
<td>ccF2</td>
<td>CC3, CC8</td>
<td>Development time of Web applications</td>
</tr>
<tr>
<td>ccF3</td>
<td>CC1, CC2</td>
<td>Cost/benefit analysis of Web applications</td>
</tr>
<tr>
<td>ccF4</td>
<td>CC4, CC5</td>
<td>The what and how of Web applications</td>
</tr>
</tbody>
</table>

5.4 Web Application Development Methodologies (SM1-SM6)

Table 13.1 Explained Variance for Development Methodologies

<table>
<thead>
<tr>
<th>Factor</th>
<th>Initial Eigenvalues</th>
<th>Rotation Sums of Squared Loadings</th>
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</thead>
<tbody>
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<tr>
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<td>.846</td>
<td>14.095</td>
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Table 13.2 Factor Matrix for Development Methodologies

<table>
<thead>
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<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM4</td>
<td>.798</td>
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<td>.053</td>
</tr>
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<td>SM6</td>
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<td>.200</td>
<td>.184</td>
</tr>
<tr>
<td>SM1</td>
<td>.524</td>
<td>.261</td>
<td>.184</td>
</tr>
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<td>SM2</td>
<td>.180</td>
<td>.979</td>
<td>.085</td>
</tr>
<tr>
<td>SM3</td>
<td>.174</td>
<td>.361</td>
<td>.089</td>
</tr>
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<td>SM5</td>
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<td>.023</td>
<td>.974</td>
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</table>
### Table 13.3  Factor Descriptions for Development Methodologies

<table>
<thead>
<tr>
<th>Factor</th>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>smF1</td>
<td>SM1, SM4, SM6</td>
<td>The latest, formal, and systematic development methodologies</td>
</tr>
</tbody>
</table>

### 5.5 Web Application Development Process (SP1-SP19)

#### Table 14.1  Explained Variance for Development Process

<table>
<thead>
<tr>
<th>Factor</th>
<th>Initial Eigenvalues</th>
<th>Rotation Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
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<tr>
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<td>2</td>
<td>1.621</td>
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<td>1.527</td>
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<td>1.197</td>
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<td>.771</td>
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#### Table 14.2  Factor Matrix for Development Process

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<th>4</th>
<th>5</th>
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<th>7</th>
<th>8</th>
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<td>.128</td>
<td>.054</td>
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<td>.726</td>
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<td>.134</td>
<td>.050</td>
<td>.093</td>
<td>.069</td>
<td>.059</td>
<td>.191</td>
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<td>.079</td>
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<td>.129</td>
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<td>.058</td>
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<td>.089</td>
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<td>.236</td>
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<td>.066</td>
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<td>.059</td>
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</tr>
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<td>-.005</td>
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<td>.143</td>
<td>.726</td>
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<td>.081</td>
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<td>.145</td>
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<td>.265</td>
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<tr>
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<td>.235</td>
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<td>.147</td>
<td>.295</td>
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<tr>
<td>SP15</td>
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<td>.279</td>
<td>.122</td>
<td>.210</td>
<td>.114</td>
<td>.061</td>
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<tr>
<td>SP7</td>
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<td>.138</td>
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<td>.076</td>
<td>.913</td>
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#### Table 14.3  Factor Descriptions for Development Process

<table>
<thead>
<tr>
<th>Factor</th>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>spF1</td>
<td>SP8, SP9, SP10</td>
<td>Navigation design, presentation and page layout design, page communication/relationship</td>
</tr>
<tr>
<td>spF2</td>
<td>SP16, SP18</td>
<td>Application coding and testing</td>
</tr>
<tr>
<td>spF3</td>
<td>SP2, SP3</td>
<td>All sorts of feasibility analyses</td>
</tr>
<tr>
<td>spF4</td>
<td>SP5, SP14</td>
<td>Functionality requirements and technical specifications</td>
</tr>
<tr>
<td>spF5</td>
<td>SP11, SP12</td>
<td>Web service design and component design</td>
</tr>
</tbody>
</table>
5.6 Web Application Development Tools and Techniques (ST1-ST23)

### Table 15.1 Explained Variance for Development Tools and Techniques

<table>
<thead>
<tr>
<th>Factor</th>
<th>Initial Eigenvalues</th>
<th>Rotation Sums of Squared Loadings</th>
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<tbody>
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<td>Total</td>
<td>% of Variance</td>
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<tr>
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### Table 15.2 Factor Matrix for Development Tools and Techniques

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<td>.100</td>
<td>.124</td>
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<tr>
<td>ST5</td>
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<td>.214</td>
<td>.253</td>
<td>.252</td>
<td>.112</td>
<td>.150</td>
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<tr>
<td>ST6</td>
<td>.611</td>
<td>.201</td>
<td>.185</td>
<td>.167</td>
<td>.394</td>
<td>.150</td>
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<tr>
<td>ST3</td>
<td>.543</td>
<td>.189</td>
<td>.294</td>
<td>.098</td>
<td>.126</td>
<td>.006</td>
</tr>
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<td>.094</td>
</tr>
<tr>
<td>ST8</td>
<td>.477</td>
<td>.343</td>
<td>.213</td>
<td>.222</td>
<td>.401</td>
<td>.034</td>
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<tr>
<td>ST9</td>
<td>.461</td>
<td>.245</td>
<td>.108</td>
<td>.454</td>
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<td>.139</td>
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<tr>
<td>ST15</td>
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<td>.153</td>
<td>.176</td>
<td>.137</td>
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<td>ST12</td>
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<td>.671</td>
<td>.145</td>
<td>.142</td>
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<td>.089</td>
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<tr>
<td>ST14</td>
<td>.252</td>
<td>.588</td>
<td>.195</td>
<td>.193</td>
<td>.143</td>
<td>.323</td>
</tr>
<tr>
<td>ST16</td>
<td>.242</td>
<td>.476</td>
<td>.217</td>
<td>.140</td>
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<td>.084</td>
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<tr>
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<td>.033</td>
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<td>.309</td>
<td>.529</td>
<td>.132</td>
<td>.141</td>
<td>.139</td>
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<td>.492</td>
<td>.108</td>
<td>.111</td>
<td>.270</td>
</tr>
<tr>
<td>ST23</td>
<td>.344</td>
<td>.112</td>
<td>.489</td>
<td>.066</td>
<td>.109</td>
<td>.024</td>
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<td>ST20</td>
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<td>.478</td>
<td>.088</td>
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<td>.106</td>
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<td>ST22</td>
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<td>.303</td>
<td>.429</td>
<td>.069</td>
<td>.087</td>
<td>.075</td>
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<td>ST10</td>
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<td>.841</td>
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<td>.077</td>
</tr>
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<td>ST11</td>
<td>.325</td>
<td>.434</td>
<td>.184</td>
<td>.461</td>
<td>.208</td>
<td>.212</td>
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<tr>
<td>ST7</td>
<td>.367</td>
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<td>.197</td>
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<td>ST13</td>
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<td>.297</td>
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</table>

### Table 15.3 Factor Descriptions for Development Tools and Techniques

<table>
<thead>
<tr>
<th>Factor</th>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>stF1</td>
<td>ST3, ST4, ST5, ST6</td>
<td>Use case diagram, class diagrams, object diagrams, sequence diagrams</td>
</tr>
<tr>
<td>stF2</td>
<td>ST12, ST14, ST15</td>
<td>Web application extension to Unified Modeling Language, decision tables, hierarchy-input-process-output charts</td>
</tr>
<tr>
<td>stF3</td>
<td>ST18, ST19, ST21</td>
<td>Review/staging Web site, periodic and standardized progress, diagram generation software</td>
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5.7 Adoption Factors for Development Methodologies, Tools, and Techniques (AF1-AF7)

Table 16.1 Explained Variance for Adoption Factors

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<th>Initial Eigenvalues</th>
<th>Rotation Sums of Squared Loadings</th>
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<td>% of Variance</td>
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<tr>
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Table 16.2 Factor Matrix for Adoption Factors

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</tr>
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<td>.533</td>
<td>.349</td>
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</tr>
<tr>
<td>AF5</td>
<td>.506</td>
<td>.204</td>
<td>.192</td>
</tr>
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<td>AF2</td>
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<td>AF1</td>
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<td>AF7</td>
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Table 16.3 Factor Descriptions for Adoption Factors

<table>
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<th>Factor</th>
<th>Variables</th>
<th>Description</th>
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</thead>
<tbody>
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<td>AF3, AF4, AF5</td>
<td>Communication and management of development process</td>
</tr>
<tr>
<td>afF2</td>
<td>AF1, AF2</td>
<td>Quality and maintenance of Web application</td>
</tr>
<tr>
<td>afF3</td>
<td>AF6, AF7</td>
<td>Cost and development time</td>
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5.8 Failure Factors for Web Application Development (FF1-FF18)

Table 17.1 Explained Variance for Failure Factors

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<th>Rotation Sums of Squared Loadings</th>
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<td>7.816</td>
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<td>1.055</td>
<td>5.859</td>
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Table 17.2  Factor Matrix for Failure Factors

<table>
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<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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<td>FF7</td>
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<td>.154</td>
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<td>.203</td>
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<td>FF9</td>
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<td>.311</td>
<td>.207</td>
<td>.158</td>
<td>.176</td>
<td>.175</td>
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<td>.248</td>
<td>.217</td>
<td>.160</td>
<td>.384</td>
</tr>
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<td>FF16</td>
<td>.434</td>
<td>.283</td>
<td>.224</td>
<td>.396</td>
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<td>.193</td>
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<td>.859</td>
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<td>.154</td>
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<td>.154</td>
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<tr>
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Table 17.3  Factor Descriptions for Failure Factors

<table>
<thead>
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<th>Factor</th>
<th>Variables</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>fF1</td>
<td>FF7, FF8, FF9</td>
<td>Lack of project management control, lack of role and responsibility, top management support</td>
</tr>
<tr>
<td>fF2</td>
<td>FF17, FF18</td>
<td>Unresolved conflicts with end users and team members</td>
</tr>
<tr>
<td>fF3</td>
<td>FF10, FF11</td>
<td>Inappropriate/incorrect methodologies, development tools, and techniques</td>
</tr>
<tr>
<td>fF4</td>
<td>FF13, FF15</td>
<td>Not enough time and manpower</td>
</tr>
<tr>
<td>fF5</td>
<td>FF1, FF2, FF3</td>
<td>Ambiguous initial user requirements, ambiguous or lack of metrics for success, scope creeping</td>
</tr>
<tr>
<td>fF6</td>
<td>FF5, FF6</td>
<td>Lack of clear communication with team members and end users</td>
</tr>
</tbody>
</table>

6. Interpretation of Research Results

6.1 Important Factors for Evaluating Web Applications

The results of the very important variables in Section 3 and the factor analysis in Section 4 show that the factor of “what and how of Web application” is very significant for end users to evaluate the success of Web applications. The factor of “what and how of Web application” is mainly represented by the variables of functionality, navigation, and usability/user friendliness. On the other hand, from the developers’ viewpoint, the most significant factor for success evaluation includes the maintainability and scalability of Web applications. The importance of the factor methodologies/tools/techniques is considered as secondary by developers. From the company’s overall viewpoint, the most important factor is represented by Web applications’ satisfying business needs and their overall quality. The emphasis differences among different stakeholders are logical and understandable. While end users focus on the functionality and navigation of Web applications, the management perspective is more on business needs and product quality. While satisfying current business needs are important, developers know it better than anyone else that the users will demand upgrades and changes soon enough for them to focus more on the maintainability and scalability of Web applications. Web applications have the characteristic of being constantly in their beta mode. How to wisely and effectively capture the participation and input from users to enhance Web applications will be a challenge to developers. Methodologies/tools/techniques have to be modified to address different stakeholders’ concerns and the emerging challenges in the future.
6.2 The Importance of Development Methodologies

None of the development methodologies receives high marks from survey respondents. Rapid application prototyping is by far the most popular among respondents. Factor analysis shows that rational unified process, WebML, and Compuware’s UNIFACE are in the same group regarding how important they are for Web application development. The results in Section 3 indicate that they are not important. It seems that development methodologies which are too new, too complicated, too formal, or too specific are not considered as important. Many comments from respondents mention about hybrid approaches utilizing different methodologies, tools, and techniques work well for their companies.

6.3 The Importance of Development Phases

The factors of “application coding and testing” and “functionality requirements and technical specifications” as development phases are considered as very important, followed by the factors of “operations and business process design” and “kickoff meeting to review functional and technical specifications”. While the phase of “launch” cannot be grouped into any factor, about one-third of respondents rank it as very important.

6.4 The Importance of Development Tools and Techniques

For development tools and techniques, the factor of “review/staging Web site, periodic and standardized progress, and diagram generation software” and the factor of “application framework” are very important, followed by “program flowchart”, “ERD and story boarding”, and “work flow analysis”. The use case diagram, class diagram, object diagram, and sequence diagram in UML are loaded into one factor, which is considered as not important by survey respondents. The survey results indicate the preference of management tools and well-established modeling tools over the relatively new diagrammatic tools. Tools that can reduce development time such as diagram generation software and application frameworks are also ranked as important.

6.5 Important Adoption Factors for Methodologies/Tools/Techniques

The adoption factor of “improving quality and maintenance” is very important, followed by the factor of “improving communication and management”, and the factor of “reducing cost and development time”. The important adoption factor of “improving quality and maintenance” echoes developers’ emphasis on maintainability and scalability as an important evaluation factor for Web applications, as discussed in Section 6.1.

6.6 Important Failure Factors for Web Application Development

The survey results for failure factors clearly fall into three categories in terms of importance. The most important failure factor is represented by the variables of ambiguous initial user requirements, scope creeping, and lack of metrics for success. Factors of secondary importance include the factor of “lack of role and responsibility, top management support, and lack of project management control”, the factor of “not enough time and manpower”, and the factor of “lack of clear communication with end users and team members”. The least important category has the factor of “unresolved conflicts with end users and team members” and the factor of “inappropriate/incorrect methodologies/tools/techniques”.

7. Conclusion

There are several key findings for the research question in this project based on the variable ranking and factor analysis results from the data set. First, development methodologies, tools, and techniques are not considered as important for the success of Web application development by practitioners. Among the methodologies of rational unified process, extreme programming, rapid application prototyping, WebML, waterfall system development life cycle, and Compuware’s UNIFACE, Rapid application prototyping is considered as the most important for Web application success. Regarding tools and techniques, the new diagrammatic tools such as use case diagram, class diagram, object diagram, and sequence diagram, which are being taught as standard diagrams for object-oriented system development in classrooms, are not considered as important by practitioners. Instead, well-established and well-understood tools such as ERD and program flowchart are considered as more important. The result also
suggests that the management, communication, and control aspects of Web application development need more help than its technology aspects.

Second, end users, developers, and management have different focuses for evaluating Web application development. The focuses are functionality and navigation, maintainability and scalability, business needs and application quality respectively for end users, developers, and management. The different focuses bring our attention to the importance of developing flexible methodologies, tools, and techniques that can address different stakeholders' needs and concerns.

Third, for failure factors of Web applications, the most important factor is lack of clear user requirements, scope creeping, and lack of metrics for success. Feedback and comments show strong frustration towards ambiguous and constantly changing user requirements. The next generation of system development aids need to seriously address that issue.

References


Users and Usage of Community Websites: The myhamilton.ca Experience

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Umar Ruhi, University of Ottawa, Canada, ruhi@telfer.uottawa.ca
Paul Takala, Hamilton Public Library, Canada, ptakala@hpl.ca

Abstract
This paper presents research results pertaining to the users and usage of the myhamilton.ca community website. Data collection and analysis occurred during two different phases. The first involved the administration of an online survey and the tracking of website activities of 466 actual end-users in which a unique identification feature linked participants’ website activities with their demographic and personality data. During the second phase, a more detailed online survey asked for self-reports of website usage from 733 end-users. Results from both rounds of data collection suggest that the website provides a valuable service and is superior to traditional methods of information gathering, but there is a need to increase website usage and to reach a broader demographic. Discussion ensues on how managers of myhamilton.ca are actively addressing these concerns via the myhamilton Renovation Project as a means of increasing website utilization.

Keywords: community website, IS adoption and use, case study, e-Business

1. Introduction
This paper presents findings from two independent rounds of data collection and analysis of the users and usage behaviors of citizens who utilize the myhamilton.ca community website. Community websites or portals serve the information needs of citizens residing in a local jurisdiction (such as a city or a region), as well as outside persons or organizations (e.g., tourists, immigrants, businesses wishing to expand) who have interests in the area. These sites are designed to consolidate access to information about an area in which citizens live, rather than requiring users to locate and navigate multiple independent sites in their search for information. In a sense, these sites function as virtual communities that are computer-mediated spaces facilitating communication, information sharing, social interaction and relationship formation among participating members [7] [8] [11].

In the last few years, many municipalities and regions have launched such websites as a means of better serving their citizenry, especially in Canada [4]. These sites are believed to offer great promise in their ability to help meet the information needs of citizens, to foster community-building, and to promote a city or region to others. However, due to the relative newness of these types of sites, little is known about their effectiveness and reach [5].

How well do these sites meet the needs of end-users? What types of people visit these sites? What usage patterns exist? How are managers of these community websites responding? Answers to such questions are few and serve as the catalyst for the research presented in this paper.

In terms of organization, the next section of this paper first provides background on the myhamilton.ca website itself. Next, the first two phases of data collection and analysis are described, followed by a summary overview of the findings from both rounds of investigation. The paper concludes with a discussion of the activities that are currently underway with the myhamilton Renovation Project to improve the website’s design as a means of increasing website usage and reaching a broader demographic of users (for more information on this project, visit http://myhamilton.wordpress.com).
2. What is myhamilton.ca?

Launched on September 13, 2005, myhamilton.ca or “myhamilton 1.0” (see Figure 1 below) is a community website designed to give citizens, visitors, and businesses “one-place-to-look” or “no-wrong-door” access to information about Hamilton. Major partners involved in the development and support of “myhamilton 1.0” are the City of Hamilton and the Hamilton Public Library, with the City of Hamilton playing the lead role. Various community groups and organizations contribute content. The goal of the website is to provide a gateway to community resources by integrating relevant information sources and a variety of services.

![Figure 1. Snapshot of the myhamilton.ca / “myhamilton 1.0” website](image)

The community that the myhamilton.ca website serves is situated southwest of Toronto, with a population of 504,559. Hamilton is the third largest metropolitan area in the province of Ontario, and the ninth largest in Canada [21].

The myhamilton project began in June of 2001. Several community partners saw that Hamilton had a rich collection of local information resources. However, these were not well integrated and local residents were often unaware of them. In addition, there was no shared platform for creating community content and celebrating the diversity of community activities and events. The community saw an opportunity to help address these gaps by working together to develop a comprehensive local portal. With a strong commitment to collaborate, but limited resources available, the City of Hamilton applied for funding through the Ontario Ministry of Economic Development and Trade’s Connect Ontario Partnering for Smart Community (COPSC) program. Connect Ontario provided up to $1M (CAD) in matching funding to communities committed to making their communities “smart” through the adoption of technology. In the summer of 2003, Hamilton’s proposal was approved for $1M (CAD) in funding with a two year implementation phase beginning in September 2003. The total value of Hamilton’s initiative was $3.9 million (CAD) – a combination of financial and significant in-kind support from more than 45 community partners. The resolve and commitment of numerous organizations and individuals to work together for the good of the greater community was critical to success.
The myhamilton website integrates the websites of the municipal government, the public library and several community databases and content areas. Prior to the launch of the portal, these other websites ran independently of each other with their own separate domains and individual service and content delivery mechanisms. Constituents requiring information from multiple entities had to navigate through a maze of different websites, each with its own set of features and functions, as opposed to a unified information technology framework based on common business processes, user databases, security and privacy standards [14].

3. Phase One

The purpose of the first phase of data collection and analysis was to show the linkage between people’s behaviour at a community website and their personal characteristics (e.g., their demographics and personality traits). Doing so would allow the research team to gain an understanding of the different types of people who use the site, how these different types of people interact with the site, and why end-users of the website behave the way they do. Such insight can be used to inform the design and effectiveness of website marketing campaigns, the design of the website itself, and add to the growing body of literature on virtual communities, community informatics, and electronic government.

To facilitate the linkage between end-user behavior and personal characteristics, the research team worked in close collaboration with myhamilton.ca’s Community Portal Advisory Committee (CPAC) and two lead partners (the City of Hamilton and the Hamilton Public Library). Specifically, the research team worked with CPAC and the lead partners to build in data collection instruments within the myhamilton.ca website itself, as well as to recruit potential participants and to distribute participant incentive rewards. Participant recruitment occurred through: i) a general “Call For Participation” on the myhamilton.ca home page; and ii) individual emails to registered myhamilton.ca users. Both methods of recruitment presented potential participants with an information sheet and web-based consent form that required participants to click a radio button indicating their consent.

Upon granting consent, participants were asked to fill out a web-based end-user survey. This survey collected basic demographic information, gender-related self-concept traits, and technology background. Items were based on those found in the research team’s recent investigation of gender, self-concept and Internet use [9], the Georgia Institute of Technology’s annual GVU WWW User Surveys (www.cc.gatech.edu/gvu/user_surveys), and scales that measure perceptions of web-based information seeking [10].

From the time that a person consented to participate until the data collection period ended (at most two months – depending upon when a person first agreed to participate), a user’s web tracking activity was recorded in web tracking logs. In general, the various sources of web logs can be classified as either server-level or client-level data sources [20]. The primary metrics used in this study were based on server-level data generated through a custom programmed server-side plug-in, and first-party cookies stored on the client-side. These metrics included the following: page attributes such as page views, page transitions, and HTTP referrer information; temporal attributes such as history time stamps, and session times; and visitor attributes such as user identification tags, and remote host information. This raw web traffic tracking data was collected on each participant and used to generate several composite web usage metrics, such as unique visitors, page views, and time on site. The unique visitors metric allowed the researchers to determine reach and audience penetration, page views provided information about the popularity of particular resources and their frequency of access, while time on site helped to assess site “stickiness.”

A key strength of the above data collection instruments was that a participant’s web tracking data could be linked to his or her survey responses via implementation of a unique id specific to this research project. Specifically, a participant’s end-user survey and web traffic data were tagged with this unique id. Extra care had to be taken in protecting the end-user data that was collected because of this unique id. For example, data tagged with a participant’s unique identifier was stored in separate database tables on the City of Hamilton’s servers and not stored elsewhere in the myhamilton database. There was no linkage between the tables used to store data for this research project and any other table in the myhamilton.ca database. Therefore, it was technically impossible to link a participant's research data to a participant's identity (e.g., contact information) that was stored in other myhamilton database tables. To further ensure privacy was maintained, an independent privacy audit paid for by the City of Hamilton was performed and all recommendations from that audit were carried out.

At the end of data collection, participant incentives were distributed. Each person who participated in the study was eligible for a draw, with a one in ten chance of winning, for a $100 gift certificate at a local mall. The research team
drew the names of the “winners” of the draw and gave these names to the City of Hamilton who distributed the gift certificates. Winners had to show proper identification to claim their incentive award.

Also at this time, web tracking and survey data were extracted into files and sent to the research team for analysis. The use of the unique id stored in participants’ end-user survey and web tracking data allowed the team to use generalized linear model techniques to determine how well individual differences (obtained from the end-user survey data) could predict actual usage behavior (obtained from the web traffic data).

A total of 466 people completed the survey. The demographics were skewed towards white women, with an average age between 35 and 39 (320 females, 142 males). Males who responded were slightly older than the women but still fit into the 35-39 age bracket. Most respondents described themselves primarily as urban or suburban (not rural) and were distributed quite evenly throughout the city and its surrounding areas. Overall, this was a well-educated sample. Over 40% of respondents had either a bachelor’s or graduate degree. The average household income ranged between $60K and $80K (CAD), with women reporting a slightly higher household income. No sex differences were found in education or marital status. Many respondents declined to report their household composition; of those who did, very few had children in the home. One quarter of the sample reported “single” marital status.

With respect to Internet and technology perceptions, the sample was found to be very experienced with the Internet and both comfortable and competent with computer technology. Significant numbers had performed relatively advanced web-based tasks (e.g. created or customized a web page, changed cookie preferences). Almost all accessed the Internet daily and tended to use high-speed connections from home to do so. More than 25% of those who responded had more than three computers at home. Respondents also connected at work, and to a lesser extent, at public terminals or other access points.

In terms of web metrics, the research team managed to track the behavior of 399 people. However, ten of these did not complete the survey. Further, tracking data was not available for 67 people who completed the survey but did nothing at the website. After the data was inspected for extreme responses in terms of number of sessions and page requests, 11 respondents were eliminated from the data. Further, data where session lengths were minimal (from people who only completed the online survey or those who arrived at the myhamilton.ca website from elsewhere and then quickly left) were removed.

Behavioral analysis identified several patterns of web usage:

- **Age**: Those in the 45-49 age category did the most sessions (7.18).
- **Sex**: Women conducted more sessions than men (5.18 versus 4.28), but did not spend more time or request more pages.
- **Location in Hamilton**: There was a strong effect on the number of sessions, though no effect on either session length or page requests. Mountain Central were the heaviest users (10.75 sessions), recording significantly more sessions than all other areas, with Flamborough and Ancaster (the most affluent areas of the cities) the lowest.
- **Marital status**: Married respondents recorded more sessions than those who were cohabiting (5.09 versus 4.03) but marital status had no effect on either session length or page requests.
- **Education level**: There was a positive impact on the number of sessions, but no effect on session length or page requests. The fewest number of sessions were aligned with those having a primary school level of education (1.67) and the most with those having a graduate-level (5.78).
- **Employment status**: Students conducted the fewest number of sessions (3.52) and unemployed the most (6.39).
- **Household composition**: Those with fewer people living in a household conducted both more sessions as well as longer ones. For example, one-person households had the highest number of sessions (7.79) and the longest average session lengths (7.38 minutes). Five-plus person households had the lowest number of sessions (4.92) and the shortest session lengths (4.02 minutes).
- **Income**: Those with higher amounts conducted more sessions but of shorter durations. For example, those with household incomes less than $20K (CAD) recorded significantly fewer sessions (6.05) than those with $40-59K (CAD) and $120K+ (CAD). However, those with household incomes of less than $20 (CAD) had average session lengths of 12.56 minutes compared to those with households incomes of more that $120K (CAD) with average session lengths of 5.46 minutes.
4. Phase Two

The purpose of second data collection and analysis phase was to conduct a more detailed survey of end-users of the myhamilton.ca website. Our goal was to reach a larger end-user sample and to include a different set of questions that could shed more light on the myhamilton.ca user base.

These survey items were based partially on those used in a study of the factors that influence citizen adoption of electronic government services [3], which in turn were drawn from pre-established survey instruments from the Technology Acceptance Model [6], Diffusion of Innovations theory [16] [19], and the web trust literature [12] [15]. Additional questions were from the Sense of Community Index also were included [13]. This psycho-social factor is commonly studied in virtual community research and is consistently regarded as being essential in sustaining user participation in virtual communities [1] [2] [17] [18].

The survey comprised a combination of various Likert-scaled and categorical response type questions. No open-ended questions were asked. Respondents were free to skip any question they preferred not to answer. The survey polled end-users on a variety of issues: website usage; website perceptions; personalization of the website; perceptions of information on the website; perceptions on the advantages of using the website; perceptions of website fit; perceptions of website users; level of trust with the Internet; level of trust with community municipal website administrators and other end-users; perceptions of the community; Internet and computer skills; Internet perceptions; and demographics. Contrary to the first phase, we did not employ web tracking, but simply asked respondents for self-reports on their website usage.

Prior to data collection, a workshop was organized to elicit feedback on the survey instrument from the myhamilton.ca managers. Workshop participants not only helped to improve the language and explicability of the survey instruments, but also suggested additional items that would be useful to capture. Their suggestions were used to refine the online survey.

Participant recruitment was handled in a manner similar to the first phase, in that the myhamilton.ca lead partners assisted with recruitment by posting a message posted on site homepage announcing the study and sent email messages targeted to registered myhamilton.ca users. These messages instructed users to visit a “splash page” where they could obtain more information about the research project and start the actual survey. As an incentive to complete the survey, end-users were enrolled in a draw to receive a gift certificate at a local mall or store. Prior to starting the survey, end-users were shown an information sheet/consent form about the project. Once informed consent was obtained, end-users were directed to the actual survey. In order to protect end-user confidentiality and anonymity, contact information collected to handled the distribution of gift certificates (e.g., end-users’ names and email address) were stored separately from survey data.

In total, 733 surveys were collected. Overall, respondents indicated that the portal sites were used infrequently, with most visiting these sites only about once every two months to find information. Very few conducted transactions online, but it should be noted that this capability is restricted to only a few services on myhamilton.ca.

Despite this low usage, respondents thought myhamilton.ca provided a valuable service and evaluated it quite favorably on a number of dimensions such as visual appeal and ease of use. They also appreciated site personalization capabilities. Respondents indicated they valued the information that the site provided and believed that the site was superior to traditional methods of gathering information, such as telephoning or filling out forms.

Overall, respondents saw community municipal portal use as being consistent with their own lifestyles, but did not believe that using the site elevated their status or prestige. Users indicated a greater level of trust in the municipality (community) than they did in the Internet, but they did not think that using the portal had made them perceive their municipality (community) as being more trustworthy than during the period prior to their use. For the most part, their sense of community could be described as “lukewarm” with many responses falling either slightly under or slightly over the midpoint. Having said that, respondents did agree that their areas were good places to live where they felt at home and expected to reside for some time.

With respect to Internet and computer skill levels, most respondents indicated they had been using the Internet for more than seven years and were very satisfied with their skills. The average amount of time spent online fell just short
of the 15-19 hours per week frequency category. Connecting at home was by far the most popular choice (68.3 %), followed by work (41.1%). Compared with these locations, relatively few respondents stated they connected at their public library and even fewer through a PDA. Among those who connected at home, DSL high-speed and cable connections were most popular. Most respondents either had never visited an online or virtual community or did so only rarely. Among those who have used social networking sites, YouTube and Facebook were cited most often. In terms of Internet perceptions, most respondents indicated proficiency in their ability to find their own way around the Internet and to locate useful and relevant information. Despite the unstructured nature of the Internet, most felt comfortable and at ease with this lack of structure, indicating a fairly strong sense of control in navigating the web without getting lost. There was a greater preference for respondents when finding information to conduct keyword searches, rather than navigating web pages through hypertext browsing.

With respect to demographics, the average age of respondents fell in the 35-39 years old frequency category, although the data here were sparse. Of the 733 total respondents, 207 did not answer this question and 22 preferred not to indicate their age. Females comprised the bulk of the sample (395 or 75.1% of survey respondents who answered this question); 207 people did not indicate their gender and 10 preferred not to say. Most of the 526 respondents who indicated a race selected “white” (434). Many stated they spoke languages other than English at a general conversational level, with the most popular alternatives being French (80), Spanish (27), and German (24). Respondents also appeared to be very well educated, employed full time, and had an average household income before taxes that fell just above the income frequency category of $60,000-$79,999 (CAD). However, caution should be taken in interpreting this statistic as only 366 of the 733 respondents declared their household income. The majority of respondents who declared their household composition were one-adult households with no children.

5. Interpretation

Examining the findings across the two rounds of data collection and analysis reveals similarities in terms of end-user demographics and usage patterns of the myhamilton.ca website. Overall, website usage is low and end-users tend to comprise a narrow demographic (i.e., middle-aged, well-educated, predominantly female, white, financially comfortable, and Internet savvy). Despite end-users indicating that myhamilton.ca provides a valuable service that is superior to traditional methods of gathering information, the site appears to be underutilized relative to its capacity. These results are consistent with the research team’s findings with other community sites across the province of Ontario [5].

In response to these findings, myhamilton.ca managers are proactively addressing these concerns. A website redesign is currently underway, coined the myhamilton Renovation Project or “myhamilton 2.0.” One of the goals of the myhamilton Renovation Project is to increase community website usage by reaching a broader demographic of users and designing the site to better address end-user needs. Details of this project are described below.

6. The myhamilton Renovation Project

The original myhamilton.ca website was released in 2005. Its infrastructure is now in need of replacement, and the myhamilton development team decided to use this opportunity to reassess what is working, what is not, and to renew the website’s strategic direction. A 12-month renovation project commenced in March 2008.

Although the team still receives positive feedback from people about the fact that the website created “one-place-to-look” for the Hamilton community, they also recognize that there are still people the site is not reaching. In addition, usability and other technical obstacles prevent some users from benefitting fully from the services offered on the portal. Moving forward, there are several strategies currently being followed to ensure that “myhamilton 2.0” is able to have a broader impact on the community than that of the first generation site. Recommendations from the above phases of data collection and analysis strongly influenced the strategies being followed.

What is the purpose of a community portal? In “myhamilton 1.0,” the vision was defined as “one-place-to-look” or “no-wrong-door” for information about Hamilton. While “one-place-to-look” is still relevant, there is now a need to be more focused on what that vision achieves for the community. In moving forward with the renovation of the portal, myhamilton.ca managers are framing their goals in terms of community development. The Hamilton community has many assets, and myhamilton managers believe that the site can play a key supporting role in mobilizing those assets to improve the community. The myhamilton development team recognizes that a portal platform on its own will not...
have a big impact on community development, unless the development team can: i) collaborate with key community initiatives and organizations working to improve Hamilton; and ii) create a site that facilitates connections between people in the community, often at the neighbor level. The development team takes a broad view of the assets in the Hamilton community and recognizes the importance of giving voice to local artists, writers, smaller community groups, service clubs and churches. A community portal’s role centers on enhancing the community’s knowledge of those assets. While providing access to information about key institutions serving Hamilton is important, myhamilton 2.0 must also facilitate the horizontal sharing of knowledge between communities of interest and individuals.

The myhamilton Renovation Project has several components of performance assessment and consultation. To tap into the knowledge and experience of staff and organizations delivering services through the website, the development team began with an internal operational review. The internal review involved focus groups and surveys of authors and other people involved in managing the website. The website relies on these staff for its success and it is critical for the development team to understand and remove obstacles so that staff are empowered to take ownership for the content and services they are providing on the portal.

The operational review highlighted the need for clear governance and more efficient decision-making. In “myhamilton 1.0,” new ground was broken by fully integrating a municipal website, public library website, and a community portal. The City of Hamilton was the lead partner; the Hamilton Public Library and several community groups served as participating partners. However, over the course of the last few years, the size and complexity of the municipal government’s operations required that the City of Hamilton focused on internal service issues, leading to a change in the portal’s leadership structure. Consequently, the public library is now the lead partner in the new portal. It is anticipated that this will improve the ability of the portal to respond to the needs of community partners and organizations that fall outside the scope of municipal services. While the final governance model of the new portal has not yet been determined, it is clear that the governing body will be empowered to make policy decisions, and portal managers, working within a shared framework, will be able to execute their mandates.

Engaging in a community consultation process is a critical part of the renovation process. The first part of this consultation involves two major components: i) key stakeholder interviews and ii) community focus groups. A third-party research team is helping to ensure the process will not be overly influenced by staff already involved in myhamilton 1.0. Strong leadership is a critical component of a successful community portal. With myhamilton’s focus on community development, it is critical that the myhamilton development team connect with community leaders from broad-based, diverse, and inclusive initiatives. For example, the development team is working to align efforts with groups such as the Hamilton’s Poverty Roundtable, Early Years Centers, Hamilton Centre for Civic Inclusion, and Education City. Leaders from these groups were interviewed at length to better understand their needs and to make them aware of the myhamilton Renovation Project. Ensuring the portal meets the end-users needs is of primary concern; however, it also is important that partners’ needs are considered and addressed. Managers of the myhamilton Renovation Project understand that collaboration with organizations that align with the goals of building community are essential to increasing the community impact of the website.

Examining site feedback, site statistics and research done to date, myhamilton.ca managers have come to understand that like other community portals, the myhamilton site serves a fairly narrow demographic. Consequently, steps were taken to conduct several focus groups targeting potential groups that myhamilton managers wanted to the site to better serve. Focus groups identified customers or potential customers in the following target audiences: educators, seniors/zoomers, students and youth, newcomers, and people active in the arts and culture community. The focus groups and questionnaires have provided useful insights which are helping myhamilton set its new priorities. In addition, the team is engaging in task based usability testing and card sorting on the current site to help us develop site navigation and structure on the new site. Myhamilton managers anticipate a site that looks much different; however, they want to ensure that aspects of the site that currently work well for users are not lost in the new site.

A technical evaluation of content management systems platforms is currently underway. The technical team is using a detailed analysis provided by CMSWatch. Key technical requirements for the new platform include: ability to generate a text only alternative that will serve mobile device users and people using screen readers; ability to support robust interaction with users in multiple ways; an easy to use interface for portal authors and managers; and the ability to repurpose content so custom views can be created for particular audiences. In addition to the technical requirements, myhamilton managers are looking at the skills and knowledge of in-house IT staff. There is recognition of the need to develop on a platform that aligns with those skills. In “myhamilton 1.0,” an outside vendor did most of the
development work; this left myhamilton with IT staff that at first did not understand the platform well enough at the outset to make rapid changes. The goal this time is to ensure that on Day One of launch, internal IT staff have the knowledge and expertise to respond swiftly to changes and challenges. The technology will be able adapt to community needs through feedback and consultations – key ingredients to a responsive and sustainable community portal.

7. Conclusion

The Ontario government, regions and municipalities have made considerable investments in the development of “smart” communities across the province. Municipal and regional sites are expected to play an important role in meeting the information needs of their constituents, fostering community-building and enhancing the marketing reach of a region or area, but little as yet is known about how well these kinds of sites are meeting expectations. Only a better understanding of site visitor characteristics and their usage behaviors will allow managers to determine whether their portals are fulfilling needs. In the case of myhamilton.ca, users generally believe that the portal is a useful and convenient source of information, but it is not one that they frequently consult. Furthermore, myhamilton.ca usage is heavily skewed towards an older, well-educated, relatively affluent and Internet-savvy female. Having identified these concerns, in conjunction with insight derived from their own internal review, myhamilton managers are moving forward with consultations directed towards improving their site and their efforts to reach a broader demographic. We acknowledge that myhamilton.ca is but a single example. However, the methods that we have outlined for collecting user characteristic data that is linked with actual usage behavior, supplemented with more detailed questionnaire data, can be used by any portal managers who want to better understand how well their sites are meeting the needs of the their communities. Most importantly, studies of this nature add to the small but growing body of literature on virtual communities, community informatics and electronic government.

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References


Web 2.0 and Commercial Disputes: A Case Study of Information Sharing in e-arbitrations and e-mediations

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Abstract

Businesses often depend on Mediation and Arbitration as mechanisms to resolve disputes outside of the judicial courts. This paper examines how the Internet is revolutionizing the legal world of dispute resolution. The paper analyzes data from the academic-business interface developed by two universities working together to make openly share information related to Arbitration and Mediation, on the lines of Wikipedia and YouTube. Their initial forays in this field have been a success, encouraging increased funding and further development of their website. This paper analyzes their success, gleaning insights about user behavior and acceptance of such initiatives. The paper also explores the utility of Web 2.0 for arbitrations and its future prospects.

Keywords: Arbitrations, Web 2.0, mediation, law, business, management

1. Introduction

The Internet is poised to revolutionize the legal world of dispute resolutions, namely mediation and arbitrations. Arbitration is a legal mechanism for resolving disputes outside the courtrooms, where the parties in the dispute refer the case to one or more “arbitrators” by whose “award” decision they agree to be bound. A vast majority of trade disputes or commercial disputes in the US are resolved through arbitration [7; 26].

Arbitrations are sometimes preceded by Mediation, a process in which an impartial third party facilitates communication and negotiation to promote voluntary decision making by the parties—much like a marriage counselor. Mediations cost less and deliver results faster [10] and are frequently preferred to accepting something imposed by a third party. Arbitration is generally viewed as an efficient manner of resolving a dispute before an impartial panel of arbitrators [12]. The widespread popularity of arbitration lies in its ability to resolve disputes much faster: just 4 months against 18-36 months for traditional, and much cheaper: 35-60% lower [7] than conventional litigation courts that are not designed to handle global disputes regularly [8; 32]. Other benefits of arbitration include complete privacy [8; 36], as arbitral proceedings and arbitral awards are generally private, allowing organizations to maintain their carefully groomed public image and brand value. As it is arranged through mutual agreement, the arbitral process provides much more flexibility in its operation than a court [38; 8]. Especially when the subject matter of the dispute is highly technical, it allows the parties to customize rules and appoint arbitrators with the appropriate expertise. It also leads to a swifter justice as there are limited avenues for appealing an arbitral award and a smaller chance of a party delaying the matter.

Arbitrations also have a few problems— if a panel of arbitrators is appointed, it can be difficult to juggle around their individual schedules to arrange dates for hearing, leading to delays. Another problem is where large businesses may exert influence in consumer disputes, pressuring arbitrators to decide in their favor or lose future business. And although it is cheaper than a court, it is still an expensive process [8; 32].

The internet has revolutionized Arbitration in two ways: it has created new global disputes, while providing a mechanism for solving them. Earlier the business transactions and therefore the related disputes used to be local, limited within a state or a country. In the last decade, the advent of internet has made global transactions and therefore global disputes common place. Millions of transactions are completely digital: for example e-bay has over 150 million registered users situated worldwide, with more than 24 million items offered everyday amounting to $60 billion in 2007 (Source: www.ebay.com). Disputes are inevitable and in such disputes it is often impossible for the parties involved to meet in person, face to face. Further, it is difficult to establish the laws of which land would hold, not to mention the challenge of language, the difference in operating norms and the settlement of awards. Dispute resolution mechanisms like online arbitrations can resolve disputes speedily as well as with less expense [11; 26].
The Internet is increasingly being used to augment the benefits and reduce the problems associated with arbitrations. Internet is employed to reduce the expense, the complexity, and the time involved in the process, while allowing parties located globally to effectively use arbitration as a tool to swiftly resolve their disputes. Companies today handle millions of disputes online [26]. As of March 2006, 149 online dispute resolution (ODR) websites were in operation worldwide [39], up from 76 in 2003 and 115 in 2004 [12]. One such website, Cybersettle.com [15], has handled over 200,000 cases online with over 1.5 billion dollars in settlements. ODR websites settle more than three million cases online, helping resolve all kinds of disagreements from online trading like eBay disputes [24] to commercial disputes between multiple businesses [37], employment disputes [9], as well as the Sri Lankan peace process [20]. In the Sri Lankan peace process, it brought together parties that otherwise would never meet. It provides a space for sharing knowledge and information and keeping communication channels open for a possible dialog at any time. In a similar manner, it is used to resolve discord among employees and management to boost employee morale and productivity. Internet is a new channel for the arbitration process, where an array of tools such as email, instant messaging, bulletin boards, teleconferencing, video conferencing, and online discussion groups are used to resolve conflicts [7].

This paper explores the different ways that the field of arbitration is currently using the Internet, especially web 2.0, to revolutionize its operation. The paper then analyzes the data from an arbitration website set up in a web 2.0-style to find trends. In this exploratory study we arrive at conclusions about the utility of Web 2.0 for Arbitration and its future prospects.

In this paper we first discuss how the Arbitration process works and then we review the literature on the application of the Internet technologies and information systems to Arbitrations. After explaining the research methodology and analyzing the data, we discuss the findings and conclude the paper with a summary and postulation of the future trends in the use of information systems in Arbitrations.

2. What is Arbitration?

Although the arbitration process has grown over the past fifty years it started with the advent of the labor movement in the United States and most arbitration processes now follow, to a great extent, the labor relations arbitration model. So we will use that model to explain the arbitration process. Almost all Collective Bargaining Agreements (CBA) or labor contracts between a union and an employer have a grievance procedure for the parties to use if they believe the contract has been violated. A typical grievance procedure is three steps: first, the supervisor and union steward (representative) meet to discuss a potential contract violation and attempt to resolve the problem. The second step occurs if the problem is unresolved so the grieving party (often the union) submits a written grievance to the employer and the employer then sends back a written reply. The third step occurs if the matter is still unresolved. The grieving party requests arbitration so that a third party neutral may decide the issue(s) in dispute.

The parties typically include an arbitrator selection process in the CBA and it always provides that the arbitrator will be mutually selected. The arbitrator receives all of his/her power and authority from the CBA and is strictly bound by the requirements of the CBA. The hearing is informal but oral arguments are made, witnesses are called and evidence is submitted much like a court hearing. Many times briefs are submitted to the arbitrator after the hearing to summarize each party’s case and the arbitrator then issues a written decision deciding whether or not the contract has been violated. Both parties are bound by the arbitrator’s award and courts rarely overturn the awards.1

It should be noted that a new trend in the grievance process is to require that the parties go to mediation before arbitration. Mediation usually does not involve a hearing but rather includes a trained neutral who listens to a summary of the case from both sides and attempts to assist the parties in settling the dispute before going to the expense and time of an arbitration hearing. In Michigan, for instance, the state provides a mediator to the parties for free so it is often used as a step in the grievance process of a CBA.2

**Typical Grievance Arbitration Process**

The Grievance Process in a CBA:

- **First Step**: Oral conversation between supervisor and union steward (representative) regarding possible CBA violation.
- **Second Step**: If problem is not resolved at the first step then union puts grievance in writing and the employer responds in writing.
  - **An Example**:
  - The union wrote a grievance stating that the employer violated the CBA because it did not use strict seniority when selecting employees for over time (OT). The union demanded that the employer pay OT to all the more senior employees who were not selected for OT in accordance with the CBA.
  - The employer wrote a grievance reply stating that it did not violate the contract because it attempted to use strict seniority but when it made calls to assign OT many of the more senior employees were either not home or did not answer their cell phones. Consequently the employer was forced to use less senior employees for the OT because it was an emergency situation and needed help immediately. The employer therefore denied the grievance stating that it did not violate the CBA.

- **Third Step**: If the problem is not resolved at the second step the parties pick an arbitrator and proceed to arbitration. If a CBA provides for mediation it typically occurs just prior to arbitration.

The arbitration process provided by Benyekhlef and Gélinas [7] is shown in Figure 1 and the one provided by www.finra.org is described in Figure 2. Financial Industry Regulatory Authority (FINRA) is the largest non-governmental regulator for all securities firms doing business in the United States. The organization’s arbitration process is a good example of a non labor relations dispute resolution model. The diagram below shows their process for Arbitration with the concomitant fees.

Figure 1. The negotiation→ mediation→ arbitration process to resolve disputes [7]
Figure 2. Detailed Arbitration process for firms dealing in securities. Source: www.finra.org
2.1 Arbitration and the role of the Internet

Even in the slow, lumbering style of the traditional legal world, Internet is fast emerging as a channel to settle commercial disputes [28]. One of the first online arbitration was conducted in 1996 by the University of Massachusetts in their ‘Virtual Courtroom’ [3]. Richard Hill [21] explains the arbitration process using the Internet as follows: 1. The initial step was to use emails to exchange documents. 2. Then the parties began using the Internet to exchange evidence. 3. The final in the process now is to use electronic means to conduct arbitration proceedings with technologies such as video conferencing.

Online arbitrations seem to have caught on only in the last seven or eight years as the Internet transformed into one of the major channels for commerce as well as conflicts. Most of the research work in this field is therefore recent. The literature on online arbitration reviews various areas such as legal and regulatory issues [such as 18; 22; 29], issues of trust [1; 30] and of communication and culture [17; 4; 27] among others. The literature also shows the application of online dispute resolution to different business situations such as, consumer protection [34; 33], government and public disputes [2; 13], peace and conflict resolution [25; 20], and family disputes [6; 14]. Some of them discuss the technological issues, like problems of hardware, software, authentication, computer literacy, computer accessibility, online communication protocols, and online bidding [5; 7; 19; 16].

Arbitrations have evolved much like the auctions— moving from physical transactions, to online platform like e-bay for accomplishing the transactions. The main advantage of the Internet is the freedom not to be physically present and the use of computer automated tools, such as online document sharing and commenting and the automated bidding tools. As the web evolves from Web 1.0 to Web 2.0, the role of technology changes from just being an enabler of existing processes to being an active disrupter by radically reinventing the existing processes and enabling things that were impractical or impossible earlier [35]. There are not too many that discuss the technological issues, especially the implications of web 2.0 on online dispute resolution. A few researchers discuss the adjudication of disputes and crimes in the virtual worlds and the challenges for the judicial system [23], but there is no discussion on how these recent innovations can also assist online dispute resolution in complete new ways.

Apart from automated transactions of Web 1.0, the need now is for Web 2.0 tools that allow sharing and collaboration in the ways of Youtube, Wikipedia, and Facebook/ Myspace. Youtube and Wikipedia demonstrate the utility of accumulation of small amounts of information from different sources that lead to the creation of a compendium big enough to become a source of frequent reference for anyone and everyone. The Web 2.0 emphasizes user generated information, therefore making information available immediately and free of cost, especially for items that are not copyrighted.

From the perspective of Arbitration, it means freely sharing the information about arbitrators and mediators, as well their awards, on the internet. At present this information is not freely available on the Internet: either it is simply not in the digital form, or else it is available at a charge at websites such as AAA (American Arbitration Association). The website in this study is the first step towards a Web 2.0 approach to arbitration where it openly posts resumes and arbitral awards on its websites. Although Arbitration process may be private, the awards may not always be confidential as they have to be shared among large numbers of people directly affected by the awards [36]. In addition arbitrations involving public employees such as police, fire personnel, and teachers are public information in most states.

With Web 2.0, the Internet can play an important role before, during, and after arbitration. Before the arbitration, the Internet can help people connect for the first time across geographical regions, share knowledge and information, explore past arbitration awards and court decisions, and possibly reduce the level of conflict. On the other hand it can increase conflicts as the online channel arms and encourages the employees and employers with the information and the support from others in similar situations. The field needs further exploration by observing the experiences of web 2.0-friendly arbitration websites. This research studies one such website.

3. Data Collection and Analysis

A three stage research strategy is employed: first the research design is outlined, followed by data collection, followed by data analysis. Data was mainly collected from the website visitors. A case study methodology was used to conduct this research as it allows the research to ask ‘How’ and ‘Why’ questions that help explore issues along
with their context (Yin 2003). Such single case studies are recommended to provide a better understanding of the environmental complexity and an in-depth understanding of the issues (Yin 2003, Galliers 1992).

The validity of the case study was increased by employing multiple sources of data (Yin 2003). Data was collected using observations, interviews, and archival sources. One of the researchers was also actively involved in the project and consequently possesses an intimate, first hand knowledge of the project.

3.1 Purpose of the Arbitration Web Site

The project was to create and deploy the arbitration website at www.gvsu.edu/arbitrations. The web site’s primary purpose is to provide students and the public with free access to information about Michigan public sector grievance arbitration, arbitrator’s resumes and actual grievance arbitration awards. Typically individuals have to pay for this type of information through such web sites as the American Arbitration Association, Lexis Nexis, and Westlaw. All of these web sites require the user to pay a fee to view the arbitration awards. Yet there are many who are required to present arbitration cases or are simply affected by the outcome of the arbitration awards that are not privy to the awards because they either do not know about them or they do not have access to the previously mentioned web sites. It is interesting to note that the state of Wisconsin places all of its public sector grievance arbitration awards on a web site for free but it is the only state to provide this service.7 The lack of access to grievance arbitration awards is unfortunate because it is a growing body of law in the United States yet it is typically available only to those that have the means to pay for a web site service.

3.2 Web 2.0 and the arbitration website

Although the website was created with the intent of sharing information, initially it was not widely advertised. Advertising was limited to the researchers presenting the website at conferences. For example, the conference visit in October 2007 generated a sporadic interest. The website was generally used by students at the Michigan State University and the Grand Valley State University for their course work. This changed after the website went ‘public’ on the Wikis. The data from the website visits is provided in Table 1. It shows statistics on the daily averages and the monthly totals as well as the changes over same month last year.

In the table, the ‘hits’, ‘files’, and ‘pages’ denote different information. For example, if a request for an HTML document is made that contains two links to images and one of these images is missing, it is counted as three ‘Hits’ (one for the HTML document and two for linked image files), two ‘Files’ (one for the HTML document and one for existing image) and one ‘Page’ (just the HTML document). For our purposes, ‘page’ information would give a better view of the change in site usage than other numbers. Therefore the ‘Hits’ and the ‘Files’ information is grayed out in Table 1. The ‘unique URLs’, on the other hand, tell us how many unique page-views were made, i.e. multiple views of the same page by the same visitor or Host, are counted as 1.

The ‘Hosts’ denote how many different computers or IP Addresses accessed a website. It does not translate into unique individual users, but it is the closest one can get to such a number without a physical count. The ‘visits’, on the other hand, count visits from the same IP address as different if more than a certain time elapsed between the

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3 Public sector employees in Michigan are employees who are paid by governmental units such as the state, cities, townships and counties. Public sector grievance arbitration awards are the focus of the web site because they may be obtained through Michigan’s Freedom of Information Act, MCL15.231 (Act 442), see: http://www.legislature.mi.gov/(S(cojprf550assphyj32phtg45))/mileg.aspx?page=getobject&objectname=mcl-act-442-of-1976 (last visited on March 9, 2008). Private sector employers have no obligation to release grievance arbitration awards to the public.
6 West Law, http://www.westlaw.com/
visits. So typically the number of ‘visits’ would always be more than the number of ‘Hosts’. The ratio of visits to host will provide the repeat-rate for an IP Address, approximating it to the actual number of repeat visits from a user. The Kbytes inform us the amount of information downloaded from the website. There is considerable amount of information in downloadable files, information such as Mediator resumes and award decisions. The Kbytes information will allow us an insight into this aspect. The percentage change is calculated only over the same month last year, as the main audience in 2007 was the academia whose demand changes in yearly cycles according to the yearly course schedules.

In the second week of January 2008, this website was registered on Wikifoia and Wikipedia. In Wikipedia it appears under Arbitration, Mediation, and other related pages, located under ‘External references’. Wikifoia is a wiki to help people use the Freedom of Information Act at the state and local level. On Wikifoia a new page was created labeled “Michigan Public Sector Arbitrations and Collective Bargaining Agreements” and referenced on other Wikifoia pages on arbitrations and mediation. These wikis created a significant increase in the amount of interest in the arbitration website.
Table 1. Website access information before and after registering at Web 2.0 sites

<table>
<thead>
<tr>
<th></th>
<th>Daily Average</th>
<th>Monthly totals</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%Δ</td>
<td>Hits</td>
<td>%Δ</td>
</tr>
<tr>
<td>Jul-08</td>
<td>141</td>
<td>117</td>
<td>131</td>
</tr>
<tr>
<td>Jun-08</td>
<td>114</td>
<td>44</td>
<td>105</td>
</tr>
<tr>
<td>May-08</td>
<td>117</td>
<td>41</td>
<td>101</td>
</tr>
<tr>
<td>Apr-08</td>
<td>97</td>
<td>-5</td>
<td>87</td>
</tr>
<tr>
<td>Mar-08</td>
<td>106</td>
<td>10</td>
<td>98</td>
</tr>
<tr>
<td>Feb-08</td>
<td>222</td>
<td>141</td>
<td>168</td>
</tr>
<tr>
<td>Jan-08</td>
<td>109</td>
<td>-5</td>
<td>82</td>
</tr>
<tr>
<td>Dec-07</td>
<td>62</td>
<td>45</td>
<td>38</td>
</tr>
<tr>
<td>Nov-07</td>
<td>89</td>
<td>56</td>
<td>57</td>
</tr>
<tr>
<td>Oct-07</td>
<td>135</td>
<td>105</td>
<td>101</td>
</tr>
<tr>
<td>Sep-07</td>
<td>30</td>
<td>21</td>
<td>19</td>
</tr>
<tr>
<td>Aug-07</td>
<td>64</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Jul-07</td>
<td>65</td>
<td>42</td>
<td>43</td>
</tr>
<tr>
<td>Jun-07</td>
<td>79</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>May-07</td>
<td>83</td>
<td>41</td>
<td>46</td>
</tr>
<tr>
<td>Apr-07</td>
<td>102</td>
<td>56</td>
<td>59</td>
</tr>
<tr>
<td>Mar-07</td>
<td>96</td>
<td>49</td>
<td>51</td>
</tr>
<tr>
<td>Feb-07</td>
<td>92</td>
<td>69</td>
<td>58</td>
</tr>
<tr>
<td>Jan-07</td>
<td>115</td>
<td>92</td>
<td>77</td>
</tr>
<tr>
<td>Avg: Feb-Jul</td>
<td>58%</td>
<td>137%</td>
<td>76%</td>
</tr>
</tbody>
</table>

Legend:
- **Hits**: Any request made to the server which is logged, is considered a 'hit'.
- **Files**: Successful requests served by the server are counted as files.
- **Pages**: Any HTML document is considered a page.
- **Unique URLs**: The # of unique pages viewed, i.e. multiple views of the same page by the same visitor are counted as 1.
- **Visits**: # of requests made to the server.
- **Hosts**: Each request made to the server comes from a unique 'host', referenced by a name/ IP address. 'Hosts' number shows how many unique IP addresses made requests to the server during the reporting time period.
- **Kbytes**: The kilobytes value shows the amount of data, in KB, that was sent out by the server in the specified reporting period.
- **% Δ**: Change in the parameter compared to the same month last year.
Figure 3. Graphic depiction of some of the data in Table 1

Figure 4. The trend-view in keys statistics: Hosts, Kbytes, Visits, Pages, and Unique URLs. KBytes is converted to ‘100 Kbytes’ for better visibility.

The detailed web statistics of the month of January 2008 indicates that a rapidly increasing surge of interest
began from the third week of January. By February, it was a massive torrent. It is interesting to analyze the behavior of the new audience created using the Web 2.0 media by comparing the numbers in February 2008 the February of the earlier year. The biggest change has been in the ‘Unique URLs’ accessed, which increased over 200% overall and almost 10 times in February. After February it drops down considerably. The unique URLs inform us how many unique page-views were made, i.e. multiple views of the same page by the same visitor or Host, are counted as 1. A much greater increase in this number compared to other numbers, signifies a greater level of exploration from the visitors in February than any other month. As the number of users (hosts) increased 73%, it would be safe to assume that the number of unique URLs per user/host increased at \((9.66+1)/(0.73+1)=6.16\) times. This means the new visitors were probably 6 times more prolific in their explorations than the regular visitors. The ‘Unique URLs/host’ ratios given in Table 2 below also demonstrates this effect. Further, it is seen that such an exploration was also in effect when the website was advertised in a conference in October 2007. The effect is seen in Figure 2, with two spikes in the ‘Unique URLs’ and ‘Pages’ around October and February. Further, as the ‘visits/host’ ratio in Table 2 remains almost the same while the ‘Pages/host’ increases, it again indicates that the visitors in February and October on an average explored more pages on the website than in any other months. The ratio is probably more pronounced in October, meaning the conference audience was much more interested than the Wiki audience. However the Wikis appear to have provided many more new hosts or users.

The number of users (Hosts) appears to be slightly declining, even while the number of visits is on an increase. This probably means a ‘skake-out’ where the low-intensity/ one-time users are giving way to heavy users.

### Table 2. Ratio Analysis of the numbers in Table 1

<table>
<thead>
<tr>
<th></th>
<th>Visits/host</th>
<th>Unique URLs/host</th>
<th>KBytes/host</th>
<th>Pages/host</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jul-08</td>
<td>2.6</td>
<td>0.63</td>
<td>80.62</td>
<td>4.90</td>
</tr>
<tr>
<td>Jun-08</td>
<td>2.4</td>
<td>1.03</td>
<td>132.26</td>
<td>4.26</td>
</tr>
<tr>
<td>May-08</td>
<td>1.9</td>
<td>0.84</td>
<td>154.47</td>
<td>4.20</td>
</tr>
<tr>
<td>Apr-08</td>
<td>1.5</td>
<td>0.36</td>
<td>90.98</td>
<td>2.79</td>
</tr>
<tr>
<td>Mar-08</td>
<td>1.7</td>
<td>0.60</td>
<td>111.84</td>
<td>3.23</td>
</tr>
<tr>
<td>Feb-08</td>
<td>1.9</td>
<td>3.72</td>
<td>154.03</td>
<td>9.39</td>
</tr>
<tr>
<td>Jan-08</td>
<td>1.9</td>
<td>0.65</td>
<td>144.93</td>
<td>4.43</td>
</tr>
<tr>
<td>Dec-07</td>
<td>1.7</td>
<td>0.45</td>
<td>117.26</td>
<td>3.34</td>
</tr>
<tr>
<td>Nov-07</td>
<td>1.7</td>
<td>0.64</td>
<td>115.86</td>
<td>4.20</td>
</tr>
<tr>
<td>Oct-07</td>
<td>2.2</td>
<td>5.16</td>
<td>219.35</td>
<td>9.49</td>
</tr>
<tr>
<td>Sep-07</td>
<td>1.6</td>
<td>1.34</td>
<td>119.40</td>
<td>4.91</td>
</tr>
<tr>
<td>Aug-07</td>
<td>1.9</td>
<td>0.50</td>
<td>195.20</td>
<td>5.42</td>
</tr>
<tr>
<td>Jul-07</td>
<td>2.8</td>
<td>1.81</td>
<td>212.80</td>
<td>6.43</td>
</tr>
<tr>
<td>Jun-07</td>
<td>1.9</td>
<td>0.83</td>
<td>118.55</td>
<td>3.81</td>
</tr>
<tr>
<td>May-07</td>
<td>2.0</td>
<td>0.41</td>
<td>131.00</td>
<td>4.57</td>
</tr>
<tr>
<td>Apr-07</td>
<td>1.9</td>
<td>0.58</td>
<td>144.81</td>
<td>4.85</td>
</tr>
<tr>
<td>Mar-07</td>
<td>1.9</td>
<td>1.11</td>
<td>239.18</td>
<td>5.55</td>
</tr>
<tr>
<td>Feb-07</td>
<td>2.0</td>
<td>0.60</td>
<td>134.91</td>
<td>5.40</td>
</tr>
<tr>
<td>Jan-07</td>
<td>1.9</td>
<td>0.44</td>
<td>142.58</td>
<td>5.92</td>
</tr>
<tr>
<td>Average: All</td>
<td>1.97</td>
<td>1.14</td>
<td>145.27</td>
<td>5.11</td>
</tr>
<tr>
<td>Feb-Jul 2008</td>
<td>2.00</td>
<td>1.20</td>
<td>120.70</td>
<td>4.80</td>
</tr>
</tbody>
</table>

In the two months following February 2008, the ‘unique URLs’ decrease considerably and so do the ‘pages’, even while there is an increase in the number of hosts. This shows a dramatic drop in explorations per user. So it probably signifies the end of the ‘exploration’ phase by the new audience drawn by the web 2.0 media. Possibly now they come back for specific information only.
Also, as the number of hosts or users increase, the Kbytes of data also increases but not dramatically. In Table 2 the Kbytes/ host column shows there is not much difference among the months. This signifies that the users repose trust in the information being available at a later date also. There is no panic downloading of all the free information. This is significant, given that there are few online sources of data provided by this website, and commercial websites such as AAA (American Arbitrators Association) charges users for similar information. It appears the users are now used to important information being and remaining available online.

The next step planned for the website is to allow users to become a ‘prosumer’ (Producer as well as Consumer of the information) by uploading any arbitration related content on their own, like the Wikis and the Youtube, and allow users to comment and exchange thoughts using the website. However Web 2.0 is not just about user-generated content. It is also about mashups, about desktop-like applications in web browsers, and about rich user experience. A mashup is where a website combines services from many different websites. For example travel websites like Expedia combine mapping information from google, address data from hotels and availability data from airlines to create a travel plan on the fly. Similarly, now there can be a website that combines information from the above discussed arbitration websites, with tools like Google docs and google calendar for joint formulation of disputes and for scheduling, use discussion forum and project management tools from 37signals, video conferencing from skype, bidding services from e-bay, polling tool from quimble, and virtual visualization from second life, to generate on-the-fly, configurable, customizable arbitration processes to suit the specific needs of the user. Such a service will provide different tools at every stage of the dispute, while allowing the users the best-of-the-breed web 2.0 tools available in the market. It might seem like a big effort to create such a website, but last year JackBe, Microsoft’s Popfly, and IBM’s QEDWiki, and a few others have come with browser-based mashup-makers that help users to quickly and easily create such mashup websites on the fly, in minutes. As these services as well as the mashup makers themselves behave more like desktop tools rather than web browsers, they provide a rich user experience by placing many more facilities at the finger tips of the users. This is what this website is planning for in the immediate future.

Such a Web 2.0 implementation can radically change the dispute resolution process. Imagine a probable dispute that comes up as a simple comment from a user, becomes ‘viral’, i.e. rapidly garners wide spread support from other users, like certain youtube videos do. Users discuss virtually, with inputs from legal experts as well as inputs from their adversaries. Labor union--management discussions can now be in the open for all workers to participate at every stage. Ideas may be generated using brainstorming tools from mindmiester and filtered out using polled tools from quimble. The negotiation process will blur into higher level discussions on discussion boards. Higher levels of complexity and a great amount of information may be processed in a 3-dimensional space of virtual worlds in a manner reminiscent of science fiction works like ‘Minority report’. Mediators will emerge on the fly and so will the arbitrators. With enough inputs and discussions from all possible sides, there is a greater chance that the disputes will have higher levels of context and get resolved faster and amicably. Due to the open nature of such forums, disputes that are inherently biased will get discouraged by the fear of public ridicule. But on the same note, some valid disputes may not surface due to fear of public ridicule, especially those relating to issues like gay relationships and child abortion.

Web 2.0 has already led arbitrations into new directions and opened up new issues that are difficult to understand, leave alone adjudicate [23]. However, it has also opened up door to new solutions that were unimaginable or impossible a few years ago.

4. Conclusion, and Future research

The paper began with the aim of exploring the application of Web 2.0 to the field of arbitrations. The paper reviewed the relevant literature and concluded there is not enough discussion on this issue. The researchers then explored the progress of one arbitration website closest to the application of web 2.0 to arbitrations and evaluated its success and its acceptance among users. Even while the website is a small starting step towards the application of web 2.0 to arbitrations, it is a great success, leading to increase in funding,
paving the way towards a greater level of web 2.0 features.

Apparently web 2.0 was first coined in 2004 to describe the new stream of websites with revolutionary, mindset-breaking ideas [31]. Although it is rapidly growing, Web 2.0 is still a very new realm and it is difficult to extrapolate what new path breaking ideas may come up tomorrow and take us in a completely new direction. The paper shed some light on how today’s web 2.0 may be used to conduct arbitrations in the future. However this area needs to be further explored.

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A Multi-Agent Business Intelligence Framework for the Travel Sector

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Abstract

Business Intelligence in the travel sector includes dimensions such as market intelligence, customer relationship management, yield management, employee scheduling, over/under booking, tour management, and security management. Each of these dimensions is elaborated on and put in an overarching framework to enable better business intelligence management for the travel sector, identifying both internal and external partners in an increasingly complex industry with ongoing customization of product/service offerings, detailed customer segmentation, and data integration requirements. A multi-agent business intelligence framework is used for the customer interface and customization, linked to a corporate business intelligence system displaying the dimensions above.

Keywords: business intelligence, tourism, travel, competitiveness

1. Introduction

Business intelligence can be defined as the set of concepts that involves technologies, applications and practices which are used to collect and analyze business information to enable organizations improve their decision making process. It mostly uses data previously stored in a data warehouse or a data mart, and includes the business operations’ historical, current views and future outlook (predictions). Examples in the tourism travel sector include market intelligence, customer relationship management, yield management, employee scheduling, over/under booking, tour management, and security management.

New on-line travel agencies play an increasingly central role in the travel and tourism sector; by combining an agency merchant model with dynamic packaging, resulting in a radical change in terms of organizational processes, strategies and underlying IT infrastructures.

Hinton and Mieczkowska [11] identified three main issues in this context: process integration (consisting of the deconstruction of the package tour and the adoption of dynamic packaging technologies), business intelligence tools integration, and the operating context. Dynamic packaging technologies are opted for by most tour operators to meet customer demand and expectations, and manage inventory and yields more effectively and accurately. Information gathered can be classified into 2 two groups; static information and dynamic information. Static information consists of elements like furnishings or location of a hotel, whereas dynamic information changes dynamically over time, such as the capacity of hotels or seasonal trends. In the travel sector, we can also distinguish pre-trip information, which tourists use prior to taking the tour/trip, and in-trip information which is used throughout the trip, and which is becoming increasingly important. Business intelligence tools are very helpful in not only reducing information gaps among suppliers and customers by providing accurate information about the products on offer, but may also include software and hardware devices like speech dialog systems for in-trip information services, which provide information via a mobile phone at the destination related to sights to visit, accommodation, opening hours, entrance fees, the weather, and other queries on demand. Such emerging systems use artificial intelligence coupled with computer technology and voice commands, and can be found in air and rail booking services, airport, traffic information or weather reports, as well as in tourist offices, shops, museums, and information on timetables of public transport.

Websites used in this sector are mostly customized, maintaining independence and assuring a personalized style in communicating with customers [3]. A new trend in this area is the ongoing development of search engines and recommendation systems based on dynamic agents [7]. Such internet enabled developments will continue to change travel related information gathering and the purchasing of a wide range of travel related goods and services. Business intelligence tools enable merchant brokering by comparing different suppliers and pricing information, service delivery modes and times, providing customers with increased flexibility in travel time scheduling. For example, once customers have selected their travel destination, a selection of flights, arrangements for travel to and
from the airport, and activities to engage in at the destination, are presented. Customers can then perform a cost-benefit analysis of the choices offered, and finalize their selection. Such data can be used to organize a ‘trip’, conduct internal and external searches, manage search criteria as well as mutual constraints, form a choice set, evaluate and compare alternatives based on price calculations and brokering between multiple merchants, handle affective and intangible attributes, filter stimuli, reduce perceived risk, develop conceptual frameworks, and define assumptions. Such business intelligence tools can be further developed to address some or all of these elements.

Business Intelligence Tools in the travel sector can be subdivided into:
1. Market intelligence applications
2. CRM
3. Yield Management
4. Over/underbooking
5. Employee scheduling
6. Tour Management

Each of the listed BI-tools is briefly explained below.

2. Business Intelligence Tools for the Travel Sector

2.1 Market Intelligence
Market intelligence (MI) is the process of acquiring and analyzing information in order to understand the market (both existing and potential customers); to determine the current and future needs and preferences, attitudes and behavior of the market; and to assess changes in the business environment that may affect the size and nature of the market in the future [5]. Market Intelligence performs both a market analysis and competitor analysis role, and it involves assessment of strategies, competitor perceptions, effectiveness of current operations, competitor capabilities, and long-term market prospects. In the travel sector, market intelligence may refer to demand forecasts, competitor promotions, and the like.

2.2 Customer Relationship Management
"Customer Relationship Management (CRM) was recently defined as an enterprise business strategy designed to improve corporate profitability by building and maintaining better relationships with customers" [9]. CRM Systems provide information to companies that help them coordinate all the business processes that deal with customers in sales, marketing and service in order to optimize revenue, achieve customer satisfaction, and customer retention. The information obtained helps firms identify, attract, and retain the most profitable customers, provide better service to existing customers, add others and hopefully increase sales. CRM as a business intelligence tool answers questions such as “What is the value of a particular customer to the firm on a lifetime basis?”, “Who are our most loyal customers?”, “Who are our most profitable customers?”, “What are the specific products and services that these most profitable customers buy?” Different types of CRM systems can be grouped under: Operational CRM, Sales Force Automation, Analytical CRM, Sales Intelligence CRM, Campaign Management and Collaborative CRM.

Operational CRM provides support to "front office" business processes, including sales, marketing and service. Each interaction with a customer is generally added to a customer's contact history, and staff can retrieve information on customers from the database when necessary. The major benefit of Operational CRM for companies is that customers can interact with different people or different contact channels in a company over time without having to describe the history of their interaction each time. This data processes by operational CRM can be used in some operational purposes like; managing campaigns, achieving enterprise marketing automation and sales force automation.

Sales Force Automation (SFA) on the other hand is a type of Operational CRM that is designed to achieve automation in sales-force-related activities, such as lead tracking. Software products perform such tasks like keeping lists of leads, assigning the segments to salespeople, tracking responses, generating reports, and allowing list contacts to be dialed by telephone or e-mailed.

Analytical CRM analyzes customer data for using in several functions like; design and execution of targeted
marketing campaigns to optimize marketing effectiveness, design and execution of specific customer campaigns, including customer acquisition, cross-selling, up-selling, retention, analysis of customer behavior to aid product and service decision making (pricing, new product development etc). Also Analytical CRM analyzes data for management decisions such as market positioning, financial decision making and forecasting, and customer profitability assessment.

Sales Intelligence CRM is very similar to Analytical CRM, but it is generally used as a more direct sales tool. Sales Intelligence CRM has features including the use of "alerts" to sales people based on analysis of such factors as: Cross-sell/Up-sell/Switch-sell opportunities, sales performance, good or bad, customer margins and customer trends within the segments.

Campaign management software is a tool with a marketing orientation. It combines elements of Operational and Analytical CRM and allows campaigns to be run on an existing client base. Campaign Management is also used while choosing campaign recipients from the client base according to selected criteria, development of a campaign offer, assigning specific campaign offers to selected recipients, automatically sending offers to the selected clients via selected channels; either directly, via channels such as e-mail, or indirectly, by creating lists for use in channels such as direct mail, as well as gathering, storing, and analyzing campaign results.

Collaborative Customer Relationship Management coordinates the multi-channel service and customer support by providing the infrastructure for faster, more responsive and effective support to customer issues, questions, complaints, etc. Collaborative CRM aims to get various departments within a business (sales, technical support and marketing) to share useful customer information from different customer contact points throughout the company. Collaborative CRM's ultimate goal is to use information collected from all departments to improve the quality of customer service. We now turn to yield management as another business intelligence tool for the travel sector.

2.3 Yield Management
When planes, trains, or ships depart, for example, unused seats are lost forever. Similar problems occur for vacant hotel rooms, unsold concert tickets, idable tables at restaurants, and many other fixed-capacity services [8]. Linked to the perishability problem is a capacity-constraint problem. To profitably fill capacity, many service providers use complex pricing systems administered by a computer. Such systems, referred to as yield management systems (YMS), employ techniques such as discounting early purchases, limiting early sales at these discounted prices, and overbooking capacity [12]. The basic idea behind yield management is that different customers are willing to pay different amounts for the service [2]. In fact, yield management is not truly a new concept nor is it an innovation in the service industry. Yet, information technology is now regarded as the main factor enabling the effective implementation of yield management in service firms. It is claimed that service organizations that efficiently employ computerized yield management techniques can achieve increases in revenue of between two and five per cent and gain a competitive advantage over their competitors [4].

2.4 Over/Under Booking
As an example, it is possible for a customer to book a ticket on an airline flight and not show up for the departure. If that is the case, the airline may end up flying an empty seat resulting in lost revenue for the company. In order to account for such no-shows, airlines routinely overbook their flights: based on the historical rate of no-shows the firm books more customers than available seats. If, by chance, an unusually large proportion of the customers show up, then the firm will be forced to 'bump' some customers to another flight. Hotels and rental car agencies also overbook. When determining the optimal level of overbooking, the calculation is similar to the calculation used for yield management. The optimal overbooking level balances (i) lost revenue due to empty seats and (ii) penalties (financial compensation to bumped customers) and loss of customer goodwill when the firm is faced with more demand than available capacity [15]. Finally, we note that when different service providers offer one service at different times, the overbooking penalty also may involve the additional penalty of shifting customers to competitors, as well as the opportunity cost of losing future customer loyalty.

2.5 Employee Scheduling
“The employee schedule is a list of employees who are working on any given day, week, or month in a workplace. Scheduling software is used to allow organizations to better manage staff scheduling. Such software will usually track vacation time, sick time, compensation time, and alert when there are conflicts. As databases of schedules are accumulated over time, it may analyze past activity and prepare data for payroll. Some of the benefits are listed
below:

- Better achievement of contracted service level agreements
- Field workers completing more jobs per day
- Improved worker, equipment, and vehicle utilization
- Increases transparency of field operations
- Minimizes job administration cost.

### 2.6 Tour Management

Business intelligence tools relating to tour management help handle all aspects of tour management, including streamlined booking and invoicing, effective vendor and traveler communications, robust marketing segmentation and tracking, in-depth operations analysis and reporting, and much more. An example is ViaTour software systems (http://verticals.botw.org/Software/Hospitality-and-Travel/Tour-Operator/).

For example, product creation may involve a wide variety of holiday products including: charter and scheduled flights, hotels, villas, car rental, transfers, excursions, ski packages, and insurance. Holiday offers can be made available for sale via different sales channels, websites, or call centers. Product flexibility offers a service of quickly creating specific date-related offers utilizing existing inventory and allocations. Such service enables tour operators to compete more effectively with companies that specialize in these kinds of date-specific offerings. The financial dimension of tour management business intelligence includes sales and purchase ledgers, general ledger, and bank account management including check, cash, and credit card batching for bank reconciliation. Such purchase ledger can be automatically changed using standard costing when bookings are made, facilitating subsequent cost authorization and supplier invoice reconciliation.

### 2.7 Security Management

Nowadays pro-active dealing with potential security threats is becoming a part of the international travel scene. Security management in this context relates to identification requirements such as passport and visa requirements. Examples include the interfacing with homeland security in the US for travelers of different nationalities, or the passport requirements in the Schengen Area in Europe (the most prominent passport free travel zone in the world) [10]. Another example is the “common travel area” between the UK and Ireland. Other future passport free travel zones are being planned, including the Caribbean Community and Common Market (CARICOM), South American Community of Nations (CSN), or Economic Community of West African States (ECOWAS) (ibid). In addition, linking security to international tourism may require alternative forms of identification pending the nature of the traveler. As these security and identification issues evolve content wise and technologically, they create another dimension of business intelligence that travel agents will have to cope with successfully.

### 3. A Multi-Agent Business Intelligence Framework

The previous discussion summarizes the different dimensions of today’s business intelligence framework for the travel industry. While application of such business intelligence tools will vary greatly across customer segments and/or product/service offerings, they will become increasingly complex as customer travel internationalizes and intensifies further.

A multi-agent business intelligence framework is proposed to canvas this complexity in producing elevated service offerings with greater customization for the customer, based on the multi-agent system approach by Wickramasinghe, Amarasisi, and Alahakoon [16].

Multi-agents systems offer specialized problem solution pathways that incorporate mathematical techniques, generic algorithms, and clustering techniques, and deliver more customized solutions to the customer [14]. This multi-agent approach is built around a knapsack mathematical problem formulation that optimizes item selection, or resource allocations, in a constrained environment (size of the knapsack) [13].

Within a travel sector, solving a business problem like booking a hotel, multiple knapsacks, working across multiple dimensions, contribute to, and so build, the component solutions to the business problem. These dimensions may refer to, for example, time, cost, location, room size, room quality, transport, logistics, and dining requests and constraints, all to be potentially sought by the customer in building a customized solution. To add to this complexity,
other constraining factors may apply, such as time of year, facilities availability, and payment methods. Here, the distributed agent builds multi dimensional knapsack problems based on the total customer request, and subsequently solves (optimizes) these using generic algorithms.

The central administrator agent then collects requests from the distributed agent components, and looks for additional contributions to the optimized distributed agent interim solution. It may draw comparisons from available similar data which it has available as clustered similarities (or differences). It may then offer this additional complimentary information to the distributed agent interim solution. For example, to determine hotel preferences in terms of value for money, budget, cost, and time may be assigned to an unattached distributed agent, and re-formulated as a knapsack problem and solved using generic algorithms. As such, the customer may revisit, and iteratively re-run the program seeking to optimize their specific requirement mix – such as different booking time, different value level accepted, or working off a different budget. The distributed agent then checks for constraints like being well within budget, and sources alternatives within budget that complement the initial preferences expressed by the customer, using a neural network system incorporating hierarchical structures similar to those explained by Alahakoon, and Halamgume [1]. Hotels with near matching solutions to neural determined targets are hierarchically prioritized with additional knowledge or information drawn from the central administrator system, such as restaurant dining locations, or from partnering external database systems like specific restaurant menu options, and ‘next tour’ booking availabilities. This solution is then relayed to the customer across the business-customer encounter interface as the best current solution to his/her request.

Aside from relating the multi-agent business intelligence approach to the travel sector, we propose to extend this methodology of Wickramasinghe, Amarasi and Alahakoon [15] to also include information from partnering external database systems in the deployment of central administration agents. For example, specific restaurant menu options, ‘next tour’ booking availabilities, and bus-to-airport pickup may be included in the multi-agent framework. The multi-agent customer business intelligence framework is illustrated in Figure 1.

![Multi-agent Customer Business Intelligence Framework](image)

*Figure 1. Multi-agent Customer Business Intelligence Framework, adapted from Wickramasinghe, Amarasi & Alahakoon [15]*

In addition, we propose to link the multi-agent business intelligence customer interface with an overarching corporate business intelligence system that integrates the business intelligence system dimensions discussed earlier. For example, particular corporate partnerships with participating hotels may yield additional information on pricing.
structure using a yield management program, feasible packaged deals using its tour management interface, and customer preference dealing using a CRM package, all of which check the feasibility of the proposed multi-agent solutions before these are presented to the customer. As such, more holistic customer solutions are presented that are still customized to customer needs, but also fit well within the set parameters of the corporate business intelligence system. Both the multi-agent system and the corporate business intelligence system make up the total business intelligence framework of a particular travel business. The overall business intelligence framework is displayed in Figure 2.

4. Conclusion

Business Intelligence in the travel sector is illustrated along dimensions of market intelligence, customer relationship management, yield management, employee scheduling, over/under booking, tour management, security management, making up the corporate business intelligence framework. This in turn is linked to a multi-agent business intelligence framework for the customer interface which is conceptually enlarged and illustrated to include partnering external database systems. The resulting overarching business intelligence system produces more customized solutions to customer needs, while also meeting set parameters of the corporate business intelligence system such as price setting, capacity management, customer preference management, tour profitability management, and the like.

References


A Visual Map to Identify High Risk Banks - A Data Mining Application

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Abstract

The increasing numbers of commercial bank failures have evolved into an economic crisis that has received much attention in recent years. The economic aftermath of large-scale bank failures is devastating. It triggers a domino effect that ripples across different sectors of the economy. It is therefore both desirable and warranted to explore new techniques and to provide early warnings to regulatory agencies. Regulatory agencies use a number of instruments to monitor their member banks. Those include quarterly and yearly reports, on-site examinations, and surveillance systems. The last instrument is of primary interest to our study. A surveillance system is an off-line system that identifies high-risk banks on the basis of their financial status. It provides early warnings to an agency to draw its attention to those banks that have a high likelihood of failure in the next one to two years. Numerous predictive models have been developed to identify problem banks for this purpose. Those models are closely related to research in financial distress spearheaded by Altman [1]. On the basis of Altman’s framework, the detection of financial difficulties is a subject that has been particularly amenable to analysis with financial ratios. A bank bankruptcy prediction model should be able to make simultaneous consideration of those ratios that bear on the problem bank status.

Predictive models based on statistical discriminant techniques as well as neural networks have been widely used in the study of financial distress [4] [5] [6]. Although some techniques perform reasonably well in terms of rate of correctness in their predictions, all methods require complex and advanced analytical skill to explain and interpret the output from the prediction model. In this study, we introduce a special type of neural networks, the Self-Organizing Map (SOM) Network that can learn from complex, multi-dimensional data and transform them into visually decipherable clusters on an output map. The visual map can help an unsophisticated user to identify high-risk banks based on their locations on the map.

The Self-Organizing Map (SOM) network is a categorization network developed by Kohonen [3]. It was originally designed for solving problems that involve tasks, such as clustering, visualization, and abstraction. The main function of SOM networks is to map the input data from an n-dimensional space to a lower dimensional (usually one or two-dimensional) plot while maintaining the original topological relations. The physical locations of points on the map show the relative similarities between the points in the multi-dimensional space. In this research, we applied SOM to plot Texas bank bankruptcy data on a two-dimensional SOM map. The map can serve as an early warning system to help decision makers separate high risk banks from low risk ones.

The data used in this study is the same data set used in Tam and Kiang [6] that includes all banks failed in Texas during the period January 1985 through December 1987. The sample consists of 81 banks that failed between January 1985 and December 1987 and 81 matching non-failed banks, all from the state of Texas. Each bank is described by 19 ratios derived from its financial statements. Data were collected one year before the date of failure to see how well the model is capable of providing early warnings.

In this study, we first used a two-dimensional map to capture the relationships among the 162 Texas banks. The output map of SOM provides a graphical interface to help decision makers to visualize the differences in financial health of the banks thus reduce the task from a multi-dimensional problem to a two-dimensional map. On the output map, each node may represent zero to many input data. The input data that are similar in higher dimension should be close to each other on the output map. One common approach implemented in previous studies was to consider each node on the output map as one cluster. However, a Kohonen network can have many nodes in the output layer; for example, a network of size 10x10 will have a total of 100 nodes in the output layer. When the number of nodes on the map is more than the number of clusters we desire, additional procedure to further group the nodes into fewer number of clusters is required. One way to do it is to manually group the points into clusters. Often
times it is hard to visually group the output from SOM especially when the map is highly populated. Hence, a more scientific approach that can help user to group the output from SOM network based on certain objective criteria is needed. In this study, we applied the extended SOM network method developed by [2] to automate the segmentation process to complement the usage of the Kohonen SOM networks. The method groups the output from SOM based on a *minimal variance criterion* to merge the neighboring nodes together. We then compared the result from SOM with that of discriminant analysis and logit models. The results show that the SOM method generates distinct groups as good as, if not better than, that of the discriminant analysis and logit approaches.

A possible future research is to use the map to determine cases to study for understanding bankruptcy. For example, we can study the banks that are close on the map or even fell on the same node but have opposite outcomes, one failed and one survived, a year after. The map tells us that the two banks were in very similar financial status a year prior to one bank went bankruptcy. We can run SOM model again to generate a new map using the new financial data and see if the two banks are now apart from each other. If the two banks still fell close to each other, it may suggest that the other bank maybe on the verge of bankruptcy. If the two banks have moved away from each other, we might want to take a closer look at the management of the two banks to study the reasons that make the two banks to have such different outcomes. In summary, SOM network is a valuable decision support tool that helps the decision maker visualizes the relationships among inputs and can be used as complementing tool with other classification methods such as discriminant analysis and logit models for data mining.

**Keywords:** SOM Kohonen Networks, bank bankruptcy prediction, clustering analysis

**References**


Decision Supporting Methodology and System Based on Theory of Constraints for Making an Optimal Product Portfolio Strategy in Shipbuilding Industry

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Abstract

Shipbuilding is a typical ‘build to order’ industry. It has a business model that generates revenues from building various ships and offshore products in accordance with owner’s requirements at each production stage. Under uncertainty in shipping market, it is very essential for the shipbuilder to prepare the fast and competitive decision for product portfolio strategy in order to maximize contribution margin by exploiting production facilities and constraints. TOC (theory of constrains) proposed by Dr. Goldratt in 1979 has been evolved into a management philosophy with practices and principles spanning a multitude of operations management sub-disciplines.[1] In this study, we introduce the unique decision supporting methodology for the optimal product portfolio sets based on TOC. This methodology is established by adopting the concept of Drum Buffer Rope (DBR)[2] in constraints planning and Throughput Account (TA)[3][4][5] in management accounting of TOC. In addition, Decision Supporting System (DSS)[6] is implemented by applying this methodology. This DSS system provides a throughput estimator with reflecting the cost structure of shipbuilding industry and a resource simulator built on heuristic algorithms to operate major constraint-resources in shipyard such as dock, quay and pre-erection area etc. Several examples are presented to show that the proposed methodology and system can effectively support the strategic decision-making process of a global shipbuilding company.

Keywords: Theory of constraints, DBR, TA, Decision supporting system, Product portfolio, Shipbuilding

References

A Case Study in eGovernment Solutions

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Abstract

This work examines a challenge faced by governments in implementing private sector delivery solutions. More specifically, an inherent problem when attempting to shift government services provided at traditional point-of-sale facilities to alternative delivery channels, such as kiosks or through the internet, is studied. It is shown that while technical solutions, such as internet applications, can be readily developed to achieve a desired business objective, the non-technical operational aspects such as payment structure, customer expectations and acceptance, and marketing have a larger role in determining success.

The experiences of the California Department of Motor Vehicles are used as an example in this paper. The department’s funding and cost recovery challenges in implementing internet based solutions are discussed. Actual measurement output data from the department are presented.

Keywords: eGovernment, credit card transaction fees, internet transactions, service delivery channel

1. Background

A basic problem for government lies in the collection of fees for products and services that are delivered through delivery channels such as the internet. Private sector companies faced this problem in the 1970s, particularly the retail industry with the increased adoption of credit cards as a form of payment, and again in the late 1990s and early 2000s with the emergence of the internet as a viable product delivery venue. [6]

As new technologies emerged - such as financial networking systems, telephone service centers, and the internet - companies adapted and incorporated them as an additional means of provisioning goods and services. Typically the preferred form of payment in these types of transactions was a credit card. The transactions were completed faster as there was no need to wait for delivery of cash or check and generally required less staff and overhead to conduct. However, the associated fees levied on merchants for utilizing credit cards eroded any operational savings and also posed a dilemma – should this new cost of doing business be reflected in the price of goods and services and should those prices be segmented between alternative delivery channels and traditional channels?

This dilemma was further expanded with the introduction of other forms of non-cash or non-check payments, i.e. debit cards, electronic checks, etc.

Merchants who accept credit cards, debit cards, or other forms of electronic payment are charged fees by the companies issuing the cards. The fee amount varies and is typically a percentage of the transaction amount. Thus, it is sometimes referred to as a transaction fee. Some states have legal restrictions on the use and handling of credit cards. For example, in California, the Song-Beverly Credit Card Act of 1971 explicitly states, “No retailer in any sales, service, or lease transaction with a consumer may impose a surcharge on a cardholder who elects to use a credit card in lieu of payment by cash, check, or similar means. A retailer may, however, offer discounts for the purpose of inducing payments by cash, check, or other means not involving the use of a credit card, provided that the discount is offered to all prospective buyers”. [1] Thus, retailers often build the credit card transaction fees into the overall price of the product or service. Essentially every purchase of the item, irrespective of the payment format, subsidizes the transaction fees.

Companies typically incorporate the business cost of providing alternative payment features, such as credit cards, into the overall price structure of their products irrespective of the delivery channel. Furthermore, this product price structure is sufficiently built to allow incentives for customers to utilize the more efficient delivery channels. For example, a product from a retail electronics company will be offered in the retail establishment at a same price for cash payment, for check payment, for debit card payment, or for credit card payment. A customer pays the same price in the store no matter what payment option is used. Yet that price is set at a level large enough so the same
item can be sold through the company’s website at a discount, in spite of the fact that the only payment option in this channel is via credit card.

Examples of this are readily found in not only product offerings – electronics, office supplies, hardware, etc. – but also in service offerings. Airlines, hotels, brokerage firms, cable television providers all provide services at discounted prices if procured through the internet and paid for using non-cash or non-check methods.

Public acceptance of this practice has led to an expectation that makes it difficult for governments to emulate. Citizens expect goods, products and services to be consistently priced irrespective of payment options. Furthermore, there is an expectation that prices should remain at the same level, if not discounted, for utilizing more efficient delivery channels. The price is set at a baseline through the traditional delivery means. Any additional delivery channels are expected to maintain that baselined price. And, in some instances, there is an increased expectation that prices should be reduced for these non-traditional delivery channels.

The problem is similar to one currently faced by the banking industry and the operation of their automated teller machines (ATMs), particularly off-site ATMs and “off-us” ATMs. Practical use of ATMs first began in the 1970s with banks installing the machines on the premises of their branches, either inside the building or immediately outside the branch offices. These machines offered customers the convenience of conducting business – withdrawals, deposits, etc. – without having to interface with a human teller. Initially, banks did not charge customers a fee for using these machines. The customers were exclusively the bank’s customers, as the ATMs could not process competitor’s transactions, and utilizing the machines provided the bank a competitive advantage.[8] However, technological advances soon made it practical for banks to provide basic services to customers from other banks. Customers could now utilize other financial institution’s ATMs, i.e. “off-us” ATMs, for withdrawal, transfer, and deposit transactions. This was made possible through shared ATM networks with other banks. This feature, however, also made it possible for fees to be charged between banks for providing these services to their customers. As a result, some banks passed the fees directly to the customer by charging them for utilizing the ATMs from other institutions.

This practice has further expanded with the emergence of privately owned ATMs. Owners of these ATMs charge a fee for using the machine in addition to the fee charged by the customer’s financial institution.

With the advent of these privately owned ATMs, banks and other financial institutions also began debuting their ATMs in locations away from their branch offices. The cost to maintain and operate these off-site or off-premise ATMs is generally more than the cost to maintain and operate the ATMs in traditional offices. [7] Without a cost recovery strategy, operating an off-site or off-premise ATM results in an overall financial loss for the bank. Thus, banks have sought to recover these costs through additional transaction fees levied on transactions using the ATMs. This has led to consumer complaints and subsequent legislative action. [9] Banking customers are faced with inconsistent pricing for the same service delivered through different channels.

Governmental agencies face the same problem. However, in contrast, they often have the price or fee for their products and services determined by legislation. For example, the fee for a Class C California driver license is defined in statute as $28. [2] Governmental agencies are limited in their ability to change the fees that are charged for services. Thus, lacking legislative action, they have no authority or flexibility in altering the fee as retailers do when changing product prices to account for varying payment options or delivery channels.

This problem is examined in more detail with a California governmental agency that interfaces with the vast majority of citizens: the Department of Motor Vehicles.

2. Discussion

At its core, the California Department of Motor Vehicles (DMV) is responsible for registering vehicles and licensing drivers. There are currently approximately 33 million registered vehicles and approximately 23 million licensed drivers in California. The department also performs various other functions, including licensing and regulating automobile dealers, recording vehicle ownership, maintaining driving records, issuing identification cards, and collecting various fees and tax revenues for state and local agencies.
The department operates 169 field offices throughout the state that serve the general public. It is through these field offices that the department provides a myriad of services in the traditional over-the-counter transaction model. The department also provides some of the services through the mail. These two channels have historically been the only venue for customers to transact with the department, and payment for the services was in the form of cash or check. The department operated for decades with this model of dual delivery channels.

The model was modified slightly in the mid to late 1980s. Beginning in 1986 the DMV partnered with automobile clubs (the American Automobile Association, or AAA) to provide specific DMV services to customers in the AAA offices. Payment methods for these services were consistent with a field office visit or mail transaction: cash or check. There was no additional fee charged to the customer for this service and the department combined the tracking statistics with the field office statistics, as the field offices reconciled the transactions completed in the AAA facilities. Essentially, the AAA offices were considered an extension of field offices. Thus, the department provided its customers three service delivery channels.

In the 1990s, the DMV expanded with the addition of other service delivery channels. The department partnered with various business entities and provided them the authority and means to conduct certain transactions on behalf of the department. For example, companies began offering vehicle registration services so customers did not have to interface with the DMV. Within these channels payment from the business partner to the department is via an electronic funds transfer (EFT). Payment from the end customer and the business partner is through any means provided by the company. Thus, in this channel, alternative payment options such as a credit card or debit card are available. However, there is an expectation and acceptance of any additional fees, such as service fees, as a value added service is being provided to the customer.

Another delivery channel that was added involved telephone services. The department currently operates various telephone service centers that provide services via telephone. Telephone calls are handled by staff members or by an automatic speech recognition system, which does not require human intervention. It is through these telephone service centers that the department first began accepting alternative payment options for services.

The government service initially offered with a credit card payment option was the renewal of vehicle registrations. The fees for this service have a wide variance, depending upon the type of vehicle and its age. For example, a customer renewing the registration for a year old automobile pays a higher amount of registration fees than a customer renewing the registration for a ten year old automobile. In contrast, the fee for renewing a driver’s license is the same amount for everyone. Typically, vehicle renewal registration fees are the highest of all the fees collected by the department.

2.1 Alternative Payment via Telephone

In 1989, the DMV began accepting credit cards as a means of payment for services delivered over the telephone. This option was made available for the telephone calls handled by DMV personnel, as the advanced speech processing technology was not yet available at the time. In providing this service, Californians had the ability to renew their vehicle registration over the telephone and pay for the registration using a credit card. For a government agency that was often ridiculed for long lines and wait times in the field offices, this option was an appealing alternative for citizens.

Prior to offering this service through the telephone service center, citizens had two options for renewing their vehicle registration: visiting a field office or mailing the renewal notice with a check payment. The department provided the service and the associated payment option in line with the general expectation – that the price for the service remain constant irrespective of payment option. No transaction fee was imposed on the customer for utilizing a credit card and, in essence, the transaction fee was borne by the department.

Customer interest in this new service started slowly and remained at a low level. There was no concerted marketing effort to highlight the new service. As a result, only a small percentage of customers utilized this service. Segmented records for that time period are unavailable, however estimates indicate the total number of customers utilizing this service peaked at approximately 30,000 per year, accounting for less than one percent of the total number of annual vehicle registration renewals processed by the department. Table 1 details the number of vehicle registration renewals that the department processed through the mail and through the field offices. At the time of
collection, data for the telephone service centers were combined with the data from the field offices; thus, making analysis at this stage difficult.

### Table 1. Number of vehicle registration renewals processed

<table>
<thead>
<tr>
<th>Fiscal Year *</th>
<th>Field Offices</th>
<th>Mail</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 1988/89</td>
<td>10,404,685</td>
<td>11,228,388</td>
<td>21,633,073</td>
</tr>
<tr>
<td>FY 1989/90</td>
<td>11,262,844</td>
<td>11,048,073</td>
<td>22,310,917</td>
</tr>
<tr>
<td>FY 1990/91</td>
<td>10,201,643</td>
<td>12,457,788</td>
<td>22,659,431</td>
</tr>
<tr>
<td>FY 1991/92</td>
<td>10,351,898</td>
<td>12,761,467</td>
<td>23,113,365</td>
</tr>
<tr>
<td>FY 1992/93</td>
<td>8,005,004</td>
<td>15,224,071</td>
<td>23,229,075</td>
</tr>
<tr>
<td>FY 1993/94</td>
<td>7,078,836</td>
<td>15,802,940</td>
<td>22,881,776</td>
</tr>
<tr>
<td>FY 1994/95</td>
<td>7,120,311</td>
<td>15,790,943</td>
<td>22,911,254</td>
</tr>
<tr>
<td>FY 1995/96</td>
<td>7,362,999</td>
<td>16,054,766</td>
<td>23,417,765</td>
</tr>
</tbody>
</table>

* A fiscal year begins on July 1 and ends on June 30.

The data clearly show in 1988 there existed a fairly even split between vehicle registration renewals processed in the field offices and those processed through the mail, leading to a gradual shift in transactions from the field offices to the mail. By 1995, the number of vehicle registration renewals processed through the mail outnumbered the vehicle registration renewals processed in the field offices by almost 2.2 to 1.

![Number of Vehicle Registration Renewals Processed](image)

**Figure 1. Shift of vehicle registration renewals**

Figure 1 graphically displays the shift of annual vehicle registration renewals from the field offices to mail processing. In addition, it is important to note a gradual increase in total annual vehicle registration renewals.

Initially the department did not include the credit card transaction fee in the price of the transaction. A citizen could renew their vehicle registration by visiting a field office and pay via cash or check, they could renew their vehicle registration by mailing the renewal forms and pay by check, or they could renew their vehicle registration by placing a telephone call and pay by credit card. All of these transactions carried the same fee (price) for the customer. It
was the same service provided over three distinct delivery channels with three different payment options and the same price throughout.

In spite of the relative low volume of telephone service transactions, the department realized the situation was not financially feasible to continue, particularly because of the credit card transaction fees. Thus in 1995, the department instituted a $3 convenience fee for credit card transactions performed over the telephone to cover the cost of the credit card transaction fees. While this was the first attempt at providing alternative, non-cash and non-check payment options, data for this phase are not readily available for analysis. Thus, this paper will focus its examination on the second stage – using the internet – as data are more readily available.

2.2 Alternative Payment via the Internet

In April 2000, the department debuted its first internet transactional application: the Vehicle Registration Internet Renewal (VRIR) program. The application allowed qualified customers to renew their vehicles online and to make payment via credit card. The department did not impose an additional fee for utilizing this service. The cost for renewing a vehicle registration by visiting the field office was the same as the cost for renewing via the internet. This was done to encourage use of the new service. It was felt that imposing a transaction fee would discourage use rather than encourage participation. It was estimated that approximately 350,000 customers would be using the online application annually and the associated credit card transaction fees would be approximately $1.3 million annually.

This application was a major step forward for the department not only in improving customer service, but also in utilizing new technologies. The department had a reputation of long lines in field offices, poor customer service, and outdated computer systems. This internet program was a technical challenge to develop and the result was a program that customers could utilize instead of visiting a field office and provided a faster delivery of service.

However, the new application was not viewed in a positive light by all. The Legislative Analyst’s Office (LAO), a nonpartisan fiscal and policy advisory office for the Legislature, reported in its Analysis of the 2000-01 Budget Bill several reservations about the new project. [4] One of the main concerns was the cost-effectiveness of the project, particularly with the transaction fees. The LAO reported applying a flat fee – similar to the $3 fee imposed on vehicle registration renewals over the telephone – to the online program was appropriate. Furthermore, it was “not appropriate for the state to absorb these fees. Instead, they should be borne by customers who are willing to pay what amounts to a ‘convenience fee.’” The LAO also believed that the project was premature for the following reasons:

- It was felt conducting the renewal transaction via mail is easier than conducting it via the internet.
- Only a limited amount of vehicle owners would be eligible (a requirement to participate is insurance information is electronically available from the respective insurance company – at the time, only three companies provided information electronically).
- It was expected that actual participation would be very low because of reservations about providing credit card data over the internet.
- It was felt the department should focus on other technology projects.

In July 2000 – four months after introduction of the VRIR program – a convenience fee of $4 was introduced into the application because of the 2000 Budget Act. [3] The control language in the Act stated, “Funds for this program (VRIR) shall not be available for payment of credit card discount fees or similar card related charges. The Department shall attempt to secure agreement with credit card vendors to waive discount fees and, where these efforts are unsuccessful, shall pass any and all credit card related costs on to customers with clear disclosure that the customer is paying a convenience fee for the use of credit card transactions on the Internet.”

Table 2 shows the monthly usage for the application for the first calendar year of implementation. For the first three months, usage doubled each month. However, with the introduction of the $4 fee, the department experienced a sudden drop in usage where it remained for the year. The month preceding the introduction of the convenience fee and the month after the introduction are highlighted in the table.
Table 2. Number of VRIR transactions 2000

<table>
<thead>
<tr>
<th></th>
<th>VRIR transactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 2000</td>
<td>5,332</td>
</tr>
<tr>
<td>May 2000</td>
<td>11,059</td>
</tr>
<tr>
<td><strong>June 2000</strong></td>
<td><strong>21,724</strong></td>
</tr>
<tr>
<td><strong>July 2000</strong></td>
<td><strong>16,985</strong></td>
</tr>
<tr>
<td>August 2000</td>
<td>16,774</td>
</tr>
<tr>
<td>September 2000</td>
<td>14,282</td>
</tr>
<tr>
<td>October 2000</td>
<td>16,873</td>
</tr>
<tr>
<td>November 2000</td>
<td>16,648</td>
</tr>
<tr>
<td>December 2000</td>
<td>17,473</td>
</tr>
</tbody>
</table>

In July 2004 – three years after introduction of the $4 convenience fee – the department eliminated the fee to encourage greater use of the application and applied for a budget augmentation from the Legislature to cover the cost, for which they were successful. The removal of the convenience fee immediately caused an increase in internet usage. Figure 2 below shows the monthly vehicle registration renewal volumes from the time the program was debuted. As can be seen, since the introduction of the $4 convenience fee, participation in the VRIR program has been at a fairly low level, although gradually increasing at a modest rate. Regression analysis for the period between July 2000 and June 2004 shows an approximate growth of 2,234 transactions/month. This growth rate changed dramatically once the convenience fee was eliminated. Regression analysis for the period beyond July 2004 shows a post-convenience fee elimination growth rate of 42,693 transactions/month; over a twenty-fold increase.

![Number of VRIR Transactions](image)

**Figure 2. Monthly VRIR transactions**

Overall data for the vehicle registration renewal processes show a shift of transactions from the different delivery channels. Since introducing the VRIR program in 2000, the department has made available other channels to conduct this transaction, such as self-service terminals (kiosks). In 2004, the department shifted all telephone renewal transactions from being handled by a human to being handled by an automated speech processing system. Table 3 shows the annual data of vehicle registration renewals in each delivery channel while Figure 3 shows the data graphically. From Figure 3, it can be seen that the internet delivery channel displays a growing trend while the field office volumes decreased to roughly half of the levels seen in 1990. At the same time the mail volumes
increased to a peak in the mid 1990s and have gradually decreased since. A fundamental question arises as to the relationship between the volume fluctuations. Figure 4 depicts five delivery channels (the self service terminals were omitted because of the relatively low volumes) and their respective volume percentages.

Table 3. Annual vehicle registration renewals processed

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Field Offices</th>
<th>Mail</th>
<th>Internet (VRIR)</th>
<th>Business Partners</th>
<th>Auto Clubs</th>
<th>Advanced Speech Processing</th>
<th>Self Service Terminals</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 88/89</td>
<td>10,404,685</td>
<td></td>
<td>11,228,388</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>21,633,073</td>
</tr>
<tr>
<td>FY 89/90</td>
<td>11,262,844</td>
<td></td>
<td>11,048,073</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22,310,917</td>
</tr>
<tr>
<td>FY 90/91</td>
<td>10,201,643</td>
<td></td>
<td>12,457,788</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22,659,431</td>
</tr>
<tr>
<td>FY 91/92</td>
<td>10,351,898</td>
<td></td>
<td>12,761,467</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23,113,365</td>
</tr>
<tr>
<td>FY 92/93</td>
<td>8,005,004</td>
<td></td>
<td>15,224,071</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23,229,075</td>
</tr>
<tr>
<td>FY 93/94</td>
<td>7,078,836</td>
<td></td>
<td>15,802,940</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22,881,776</td>
</tr>
<tr>
<td>FY 94/95</td>
<td>7,120,311</td>
<td></td>
<td>15,790,943</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>22,911,254</td>
</tr>
<tr>
<td>FY 95/96</td>
<td>7,362,999</td>
<td></td>
<td>16,054,766</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23,417,765</td>
</tr>
<tr>
<td>FY 96/97</td>
<td>7,879,699</td>
<td></td>
<td>15,645,627</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23,545,920</td>
</tr>
<tr>
<td>FY 97/98</td>
<td>9,196,583</td>
<td></td>
<td>14,352,571</td>
<td></td>
<td>54,691</td>
<td></td>
<td></td>
<td>23,603,845</td>
</tr>
<tr>
<td>FY 98/99</td>
<td>9,356,775</td>
<td></td>
<td>14,753,278</td>
<td></td>
<td>85,181</td>
<td></td>
<td></td>
<td>24,195,234</td>
</tr>
<tr>
<td>FY 99/00</td>
<td>9,685,571</td>
<td></td>
<td>15,046,401</td>
<td>38,115</td>
<td>110,337</td>
<td></td>
<td></td>
<td>24,880,424</td>
</tr>
<tr>
<td>FY 00/01</td>
<td>9,908,071</td>
<td></td>
<td>15,711,197</td>
<td>227,253</td>
<td>132,749</td>
<td></td>
<td></td>
<td>25,979,270</td>
</tr>
<tr>
<td>FY 01/02</td>
<td>10,253,330</td>
<td></td>
<td>15,284,850</td>
<td>458,444</td>
<td>159,989</td>
<td></td>
<td></td>
<td>26,156,813</td>
</tr>
<tr>
<td>FY 02/03</td>
<td>10,219,226</td>
<td></td>
<td>15,137,258</td>
<td>739,464</td>
<td>156,668</td>
<td></td>
<td></td>
<td>26,252,616</td>
</tr>
<tr>
<td>FY 03/04</td>
<td>6,913,496</td>
<td></td>
<td>14,578,568</td>
<td>1,018,378</td>
<td>195,261</td>
<td>3,026,452</td>
<td>6,941</td>
<td>25,739,096</td>
</tr>
<tr>
<td>FY 04/05</td>
<td>6,815,737</td>
<td></td>
<td>13,718,840</td>
<td>2,429,323</td>
<td>239,640</td>
<td>2,881,113</td>
<td>218,227</td>
<td>26,303,835</td>
</tr>
<tr>
<td>FY 05/06</td>
<td>7,069,134</td>
<td></td>
<td>13,441,952</td>
<td>3,454,819</td>
<td>295,915</td>
<td>3,025,312</td>
<td>237,706</td>
<td>27,525,847</td>
</tr>
<tr>
<td>FY 06/07</td>
<td>7,417,047</td>
<td></td>
<td>12,883,667</td>
<td>4,316,079</td>
<td>371,997</td>
<td>3,256,801</td>
<td>261,921</td>
<td>28,529,730</td>
</tr>
</tbody>
</table>

Figure 3. Service delivery channel percentages
Figure 4. Shift of transactions between service delivery channels

The chart depicts a sudden decrease in field office transactions in FY 2003/04. However, this is due to a change in the DMV’s record keeping. Prior to FY 2003/04, the department aggregated the automobile club transactions into the field office transactions. Beginning in FY 2003/04, the DMV began tracking the automobile club transactions separately. Thus, the decline in field office transaction volumes. The vehicle registration renewals through the mail experienced a gradual decrease that seems to mirror a corresponding increase in internet transactions. Thus, the recent data indicate the internet VRIR application may be shifting customers from the mail service delivery channel. However, more data is needed to draw more definitive conclusions.

2.3 Success Factors

Clearly the elimination of the convenience fee was instrumental in increasing the amount of internet transactions. However, that was only one of a number of factors that affected the outcome. Some of the factors were macro-level issues while others were more operational. First, the VRIR internet application was dependent upon electronic availability of insurance information. At the time of introduction, only three insurance companies were in a position to provide their data to the department electronically. In the years since 2000, more companies were able to provide their data electronically, gradually leading to the situation today, where presently all automobile insurance companies operating in the state of California provide their data.

Within each year since the introduction of the VRIR, more insurance companies have made their data available, translating into a larger number of customers eligible to utilize the program. The majority of vehicle owners, approximately 85%, are insured by the major insurance companies (State Farm, AAA, Allstate, etc.) and the effect of those records being made available, the date it was made available, and the subsequent resulting VRIR usage has not been quantified.

Another factor is the timing of the introduction of the VRIR program. While it was introduced at the height of the dot-com frenzy, a few years elapsed before widespread acceptance of the internet as a foundational method of
conducting business. [5] By the year 2005 it was more commonplace for citizens to pay their bills online, conduct banking business online, and shop online. This public acceptance of the internet in all likelihood also contributed to the increased usage of the program, but this effect has also not been quantified.

A third factor is marketing. The department has marketed these new delivery channels as well as other new offerings from the department. This outreach effort has increased public awareness of the department and its services. As with the other factors named above, this probably influenced the increased usage, but the specific effect has not yet been quantified.

3. Conclusions

This work presents a glimpse into the difficulties experienced by government agencies in implementing a seemingly straightforward service delivery solution that is commonplace in the private sector. Customer acceptance and subsequent usage of the transactional internet program for the government service described is tightly coupled with price. It is very price sensitive and additional transaction or convenience fees have a significant effect on usage.

Recommendations for future studies include examining the effect of the other factors identified above that have not yet been quantified, studying in more detail the causes of the transactional shift to and from delivery channels, and studying the effect of deploying transactional solutions on customer perception of the department.

Acknowledgement

The author would like to thank the California Department of Motor Vehicles for permitting the study and for supplying the data. Special thanks are due to Bill Davidson, Filomena Domondon, Rich Sauer, Jean Shiomoto, Kathleen Rose, and Ken Miyao.

References

[1] California Civil Code, Section 1748.1
[2] California Vehicle Code, Section 14900 (a)
Abstract

E-government is considered as hot topic tackled by many researchers as it is considered as future fact especially for the developing countries. There are different definitions of e-readiness and the successes factors and many different tools of assessment used depending on the results and goals. It very important to gauge the e-readiness state especially in developing countries, as many barriers would be considered as a big challenge. This research introduces a case study of developing countries to explore and discover the success factors that would make the e-government project viable.

The results show that it is necessary to enhance community awareness about e-literacy. Moreover the problem of professional shortage should be taken into consideration.

Keywords: e-government, e-readiness, e-government successes factor

1. Introduction

E-government services are supposed to be presented electronically [1]. Most researches had proven the importance of E-government and the most important factors that should be considered.

E-Government presents a new and innovative approach to addressing traditional problems of government services utilizing the Internet and World-Wide-Web. Government services are provided through a variety of channels including retailers, banks and post offices. It is critical that the technology solutions which sit on top of an e-Government infrastructure are within the reach of all citizens [20].

E-Government is much more than building a web site, it is the infrastructure that governments today are building to transform the way they complete their missions. Direct effects of e-Government include cost effectiveness in government and public operations, significant savings in areas such as public procurement, tax collection and customs operations, with better and continuous contact with citizens, especially those living in remote or less densely populated areas.

This study addresses the challenges that need to be taken into account to facilitate the complex relationships between government and its constituencies to enable success interaction, transaction and delivery of government services.

The paper is organized as following: in section 2, previous studies are reviewed. In section 3, story of Jordan is discussed. In section 4, hypotheses and analysis are discussed. Section 5 presents conclusion and recommendations.

2. Previous Studies

One of the local studies [1], that discuss e-government perspectives in Jordan, studied the effect of e-government on quality of the services, which are supposed to be presented electronically. It focused the need of e-government then discussed the e-government goals, the situation and barriers of e-government in Jordan. The study concluded that there is a relation between e-government and quality of the electronic services. However some studies tried to tackle e-government problem to discover whether the public sector realizes the meaning of e-government [7]. Furthermore the study listed the barriers that might face the e-government implementation then it suggested solutions to make it work successfully. On other hand, e-government would affect the strategic position of the business organization [20].
Azam [4] studied the possibility of applying e-government. He concluded that e-government is very important to support the democracy principles. The results showed that it is possible to have an e-government if the laws and legislations are found.

The recommendations of e-government conference (that held in Dubai) focused on [20]:
- The role of public sectors to aware their employees about the importance of e-government.
- Training employees to be qualified enough to used new technologies.
- The importance of public and private sectors co-operations to get the benefit of the other countries experiment.

Wescott [20] focused on the efficiency of e-government principles and its effect in monitoring, making government processes easier, questioning and reducing the managerial corruption in public sectors. These can be applied if employees participate in both decisions making and accessing information.

Another study [20] was carried out to cover all aspects of e-government. 250 organizations from 5 countries US, Australia, Canada and UK were conducted. The study introduced vision of the strategic management level and their ambitions and plans to face e-government modern principles. The study found that the strategic management succeeded in to have service in easier way, increasing the productivity level and reducing the number of compliments and shining picture of the organization.

Two studies [20][7] that can be classified as Jordanian studies tried to present an assessment model and analysis. Both aforementioned studies are alike in both assessment models and recommendations.

In [5] authors present a general framework model for e-government readiness assessment. The model consists of six factors: organizational, governance and leadership, customer, competency, technology and legal readiness. The paper concluded that e-service does not need special legislation as it requires assurance of written instructions by the authority. Also the paper suggested improving the legal system to support e-government.

Paper [6] overviewed worldwide experiences such as USA, UK, Singapore, UAE, Egypt and e-government in Jordan. It presented a model of e-government and overviewed the e-readiness in Jordan focusing on infrastructure back office management, policy and legal, community and education and how they could be built. The paper discussed the challenges facing e-government in Jordan such as shortcomings in internet infrastructure, digital geography, privacy, and security, limit IT, legal system and awareness.

Another Arab study [4] viewed Sudan experience as Sudan started applying e-government. The project is supervised by National Information Center (NIC) and ministry of Science and Technology. Author thinks that e-government main problems can be stated in culture and legal system. The most important challenge that faces the conversion from bureaucratic to e-government is employees conversion acceptance.
Success factors:
We can summarize the success factors as following:
- Most citizens should be familiar with internet [20] as in Dubai and Jordan case.
- Re-engineering management and process and hierarchy.
- Providing essential infrastructure.
- Providing technical support.
- Providing security.
- Educating the community.
- Government leadership
- Comprehensive e-government promotion.

Paper [6] recommended the following points to grantee successful conversion:
- E-government implementation should cover all activities and departments to grantee successful conversion.
- Strong support for the conversion via authority.
- Citizens should be involved in the conversion (awareness).
- Strong infrastructure preparation especially national network
- Control by government authority.
- Legal system should be updated to meet the new security requirements.
- Cooperation with other countries that have experience in this field.
- Studies and conferences should be held to over elaborating discussion.
3. The Story of Jordan

Jordan would need to apply e-government to take advantage of the opportunities offered by all trade agreements; Jordan would need a more efficient, market-oriented customs regime in compliance with world trade organization (WTO) requirements, capable of handling increased traffic at the borders while at the same time preventing the entry of pirated software[20]. The following subsections will demonstrate the

Jordan Software Industry

Many research papers have been carried out to overview the software aspects in Jordan to give an indication for the growing state of software industry in developing countries [7] and [4]. Many aspects can be considered as vital points that should be highlighted such as factors of strength, weaknesses, the difficulties and challenges Jordanian companies suffered from. In addition, it clarified the "hopes" that Jordanian companies dream to achieve with comparison to their limited capability. A questionnaire was distributed to Jordanian companies and data was collected and analyzed [3] and [7]. However other researches focus on outsourcing and how could Jordan compete in the international market [12] and[7].

As a result of increasing the number of companies that invest in the software development sector, an amendment to the Copyright Law was introduced to acknowledge that copyright ownership of all works created by employees shall rest with the employer provided that such works are related to the business of the employer and provided that employees are utilizing the knowledge, tools, and resources made available by the employer [7].

In 1999, Jordan’s parliament amended the country’s 1992 Copyright Law and passed various regulations to better protect intellectual properties [7] & [4]. Two years later, King Abdullah received a special award from the Business Software Alliance (BSA) for his efforts to enforce the country’s copyright and trademark laws. Largely due to these efforts, software piracy in Jordan has seen a steady decline since 1994, when rates reached 87%. By 2002, piracy rates had dropped to 64%, although the total losses of the software industry had risen, from US$2.2 million in 1994 to US$3.5 million in 2002[7].

4. The Sample Descriptive Analysis and Hypotheses Testing

Data for this research have been collected using a questionnaire and observation on e-government success factors, conducted for three different groups: The public sector employee, citizen and University instructors

4.1 The Sample Descriptive analysis And Hypotheses Testing

The sample descriptive

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>211</td>
<td>54.5</td>
</tr>
<tr>
<td>Female</td>
<td>176</td>
<td>45.5</td>
</tr>
<tr>
<td>Total</td>
<td>387</td>
<td>100.0</td>
</tr>
</tbody>
</table>

From the table 1 above the sample of study contain 211 male with percent 54.5% and 176 Female with percent 45.5%.
Figure 2. The sample distribution according to gender

Table 2. The sample distribution according to Experience

<table>
<thead>
<tr>
<th>Experience</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 5 year</td>
<td>124</td>
<td>32.0</td>
</tr>
<tr>
<td>From 10-5</td>
<td>208</td>
<td>53.7</td>
</tr>
<tr>
<td>From 11-15</td>
<td>28</td>
<td>7.2</td>
</tr>
<tr>
<td>More than 15</td>
<td>27</td>
<td>7.0</td>
</tr>
<tr>
<td>Total</td>
<td>387</td>
<td>100.0</td>
</tr>
</tbody>
</table>

From the table 2 above the sample of study contain 124 individuals theirs Experience is Less than 5 year with percent 32% and 208 between 5 – 10 year with percent 53.7 and 28 between 11 – 15 with percent 7.2% and 27 individuals have Experience more than 15 year with percent 7%.

Figure 3. Sample distribution according to Experience

Table 3. The sample distribution according to Social status

<table>
<thead>
<tr>
<th>Social Status</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>142</td>
<td>36.7</td>
</tr>
<tr>
<td>Married</td>
<td>222</td>
<td>57.4</td>
</tr>
<tr>
<td>Widow</td>
<td>6</td>
<td>1.6</td>
</tr>
<tr>
<td>divorced</td>
<td>17</td>
<td>4.4</td>
</tr>
<tr>
<td>Total</td>
<td>387</td>
<td>100.0</td>
</tr>
</tbody>
</table>

From the table above the sample of study contain 148 individuals are single with percent 36.7% and 222 are married with percent 57.4 and 6 individuals are widow with percent 1.6 and 17 individuals are with percent 4.4.
Table 4. The sample distribution according to age

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 30</td>
<td>219</td>
<td>56.6</td>
</tr>
<tr>
<td>30 – 39</td>
<td>98</td>
<td>25.3</td>
</tr>
<tr>
<td>40 – 49</td>
<td>43</td>
<td>11.1</td>
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<tr>
<td>More than 50</td>
<td>27</td>
<td>7.0</td>
</tr>
<tr>
<td>Total</td>
<td>387</td>
<td>100.0</td>
</tr>
</tbody>
</table>

From the table above the sample of study contain 219 individuals theirs age is Less than 30 year with percent 56.6 and 98 between 30 – 39 years with percent 25.3 and 43 individuals between 40 – 49 with percent 11.1% and 27 individuals are more than 50 year with percent 7%.

Table 5. The sample distribution according to Job Description

<table>
<thead>
<tr>
<th>Job description</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>High level</td>
<td>43</td>
<td>11.1%</td>
</tr>
<tr>
<td>Meddle level</td>
<td>78</td>
<td>20.2%</td>
</tr>
<tr>
<td>Low level</td>
<td>266</td>
<td>68.7%</td>
</tr>
</tbody>
</table>

From the table above the sample of study contain sample distribution according to the job description 43 high level with percent 11.1%, meddle level 78 with percent 20.2 and low level 266 with percent 68.7.

Table 6. The sample distribution according to the needed to accomplish any governmental transactions

<table>
<thead>
<tr>
<th>Answer</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>387</td>
<td>100.0</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>387</td>
<td>100.0</td>
</tr>
</tbody>
</table>

From the table above the sample of study contain sample distribution according to the need to accomplish any governmental transactions, the sample answers yes.
Figure 6. Governmental transactions

Table 7. Evaluation for the governmental service provided

<table>
<thead>
<tr>
<th>Answer</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Excellent</td>
<td>20</td>
<td>5.2%</td>
</tr>
<tr>
<td>Excellent</td>
<td>85</td>
<td>22.0%</td>
</tr>
<tr>
<td>No opinion</td>
<td>112</td>
<td>28.9%</td>
</tr>
<tr>
<td>Bad</td>
<td>153</td>
<td>39.5%</td>
</tr>
<tr>
<td>Very Bad</td>
<td>17</td>
<td>4.4%</td>
</tr>
<tr>
<td>Total</td>
<td>387</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

From the table above the sample of study contain 20 individuals answer very excellent with percent 5.2% and 85 individuals answer excellent with percent 22.0% and 112 individuals answer bad with percent 28.9% and 17 individuals answer very bad with percent 4.4% and 153 individuals answer no opinion with percent 39.5%.

Figure 7. Governmental service provided

Table 8. Use of the internet in accomplishing any governmental papers?

<table>
<thead>
<tr>
<th>Answer</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>7</td>
<td>1.8%</td>
</tr>
<tr>
<td>No</td>
<td>380</td>
<td>98.2%</td>
</tr>
<tr>
<td>Total</td>
<td>387</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

From the table above the sample of study contain 7 individuals who use of the internet in accomplishing any governmental papers with percent 1.8% and 380 whom did not use of the internet in accomplishing any governmental papers with percent 98.2%.
Table 9. The sample distribution according to the household income?

<table>
<thead>
<tr>
<th>Answer</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less 150</td>
<td>45</td>
<td>11.6</td>
</tr>
<tr>
<td>Between 150 and 299</td>
<td>288</td>
<td>88.27</td>
</tr>
<tr>
<td>Between 300 and 349</td>
<td>24</td>
<td>0.06</td>
</tr>
<tr>
<td>Above 450</td>
<td>30</td>
<td>0.07</td>
</tr>
</tbody>
</table>

From the table above the sample of study contain 45 individuals their salary is less than 150 JD with percent 11.6%, 288 individuals their salary is between 150 and 299 JD with percent 88.27%, 24 individuals their salary is between 300 and 349 JD with percent 0.06% and 30 individuals their salary is more above 450 JD with percent 0.07%.

**Hypotheses Testing**

The First hypothesis: citizens’ awareness

Ho: There is No awareness from the citizens of the electronic government existence

Table 10. Hypotheses 1 test

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D</th>
<th>T. Value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness</td>
<td>2.5116</td>
<td>0.88555</td>
<td>-10.849</td>
<td>0.000</td>
</tr>
</tbody>
</table>

From table 10 the mean of attitude about the role of e-government in improving the Jordanian government service equals to 2.5116 with S.D equals to .88555 to test this hypotheses we use one sample T. test that compare between the actual mean with 5 likert scale (3). From the table above the T value equals to 10.849 with Sig equals to 0.000 so we reject the hypotheses H1 and accept the hypotheses H0. There is No awareness from the citizens of the electronic government existence.
The second hypothesis: Internet usage

Ho: Internet usage is not considered as obstacle of implementing e-government

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D</th>
<th>T. Value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet usage</td>
<td>3.666</td>
<td>0.785</td>
<td>16.690</td>
<td>0.000</td>
</tr>
</tbody>
</table>

From table 11, the mean of attitude about the role of e-government in improving the Jordanian government service equals to 3.666 with S.D equals to 0.785 to test this hypotheses we use one sample T. test that compare between the actual mean with 5 likert scale (3). From the table above the T value equals to 16.690 with Sig equals to 0.000 so we reject the null hypothesis H0 and accept the alternative hypotheses that Internet usage consider as obstacle of implementing e-government.

The Third Hypothesis: Communication Cost

The Eigen values equals to 1.097 with percentage of Variance 8.436 of this study which contain the following statement:
The high cost of the telecommunication through the internet reduces the desire in using the electronic government, the degree of loading (0.929) and degree of extraction equals to (0.870).

The Fourth Hypothesis: Lack of Professional People

H0: There is no Lack of professional people

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>S.D</th>
<th>T. Value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>difficulties</td>
<td>3.254</td>
<td>.3712</td>
<td>51.24</td>
<td>0.00</td>
</tr>
</tbody>
</table>

From the table above the mean of attitude about the role of e-government in improving the Jordanian government service equals to 3.254 with S.D equals to .3712 to test this hypotheses we use one sample T. test that compare between the actual mean with 5 likert scale (3). From the table above the T value equals to 52.24 with Sig equals to 0.000 so we reject the null hypotheses H0 and accept the alternative hypotheses there is Lack of professional people.

5. Conclusion

The transition to a successful e-Government requires visionary Executive leadership, Broad vision with a tactical plan, Culture change, Partnerships, A supportive public policy environment, strong infrastructure, financial resources, skilled human element, Deliver electronic and integrated public services, Bridge the digital divide, Achieve lifelong learning, Rebuild government-customer relationship, Foster economic development and Create a more participate form of government.

This study showed that the Jordan e-government is on the way and has gained clear recognition of its achievements in doing so.

Nonetheless there were several obstacles that still need to be dealt with in the near future, these include:
- The Jordanian Community suffers from e-literacy.
- There is no sufficient awareness by the citizens in applying the electronic government
- There is a concern of citizens’ privacy.
- There is Lack of professional people

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Recommendations

The main areas of further study directly relevant to this work and recommendations for the implementation of successful e-government are the following:

- Re-enforce the national training capacity to boost the ICT sector with guarantee Quality of the training (standards) and Accessibility (affordable fees).
- Expand the number of free public Internet access points.
- Provide aides at access points who can train citizens in basic computer skills.
- Create programs that include traditional media, like radio programs or newspaper columns, where citizens can learn about e-Government.
- These should be timely and when someone sends government an e-mail message, that message should be promptly acknowledged and responded to in a timely manner.
- Professional workers should remain in Jordan or ensure their resources and successes help benefit Jordan Incentives need to be in place to retain them, and to identify and attract those Jordanians living abroad
- Liberalize telecommunications industry this will effect on Lowered costs, enabled IT industry; increased company competitiveness; increased foreign investment.
- Legalize voice over Internet protocol (VOIP) by private telecommunications providers this will effect on Lower cost telecommunications

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Measuring E-government service value with the E-GOVQUAL-RISK Mode

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Abstract

This paper studies the e-government service quality and risk perceptions of personal income tax payers on e-government service value. The study uses qualitative in-depth interview and content analysis to explore the determinants of e-government service quality and risk dimensions of e-government service value. The findings suggest that perceived value of e-government service is e-government service quality, which consists of service design, website design, technical support, and customer support quality. On the other hand, the three perceived risk concerns are performance, privacy, and financial audit risk. The results can assist e-government service design not only to increase electronic service quality but also to reduce risk facets in order to enhance e-government service value and enlarge acceptance from income taxpayers.

Keywords: e-government service, E-GOVQUAL-RISK

1. Introduction

Electronic service via the Internet channel has a great impact on changing business and government operations. Electronic service can assist in enhancing service to customers and reducing operation costs to the organizations. Unlike interpersonal operations, electronic service entails greater risks to online users. Such risks include security concerns, and distrust of electronic service providers [10]. In quality management, one major factor that influences online users to adopt electronic service is the quality of the system. Many studies have developed a number of electronic service quality models [9][14][15]. Unfortunately, these models of electronic service quality are conceptualized in different ways and have found little consensus.

In the government sector, many government bureaus have realized the importance of using the Internet channel to provide service to citizens [2]. One of the successful cases of implementing electronic government (e-government) service is the Internet tax payment system - so called the e-revenue system - implemented by the Revenue Department of the Thai government. Half of the income tax payers use e-revenue to pay personal income tax during the past three years. Nevertheless, some citizens have shown unwillingness to complete tax payment via the Internet channel, primarily due to risk concerns. The value perception of e-government service rises if citizens perceive lower risk and higher service quality. These two prominent dimensions are remarkably different from prior studies due to citizen concerns about policy of the e-government service. The e-revenue system is a good e-government service context for developing factors influencing e-government service value as this system provides not only information but also transaction services via the web system. There is little published work on perceptions of e-government service, particularly in the context of developing countries in the dynamic Asian region. E-government service in much of Asia is somewhat less well accepted than in the West, and the role of personal relationships is somewhat stronger. Only a little work covers Asia, usually Singapore or Korea, which are not representative of all Asian countries. Thus, to gain deeper understanding of the issues in the Thai context, this study aims to identify the dimensions that citizens use to assess value creation of e-government service in two perspectives: service quality and risk in e-government service or the E-GOVSQUAL-RISK model. The paper addresses two research issues:

- What are the dimensions of e-government service quality?
- What are the dimensions of perceived risk in e-government service?

2. Theoretical Background and Research Framework

Service quality is widely used as a key indicator of excellence in traditional service. Superior service quality has an impact on adoption decisions. Parasuraman et al. [8] have developed the SERVQUAL model to measure service quality reliability, responsiveness, assurance, empathy, and tangibles. Electronic service quality dimensions, in contrast, are different from the traditional service quality in terms of human and technology interaction, website design and interface. Current studies of online service quality have found little guidance regarding electronic service quality via the web channel. For example, Parasuraman et al. [10] find two categories of online service quality: e-core service
and e-recovery service quality. E-core service consists of four dimensions: efficiency, fulfillment, system availability, and privacy. E-recovery service consists of three dimensions: responsiveness, compensation, and contact. Yoo and Donthu [14] propose four dimensions of e-service quality: ease of use, aesthetic design, processing speed, and security. Zeithaml et al. [16] propose seven service quality dimensions: efficiency, reliability, fulfillment, privacy, responsiveness, compensation, and contact.

Many studies focus and cover only the website quality. Specific to electronic service, the way electronic service quality model should cover the whole processes of service, such as service design, channel or website design, technology support, and customer support quality. Electronic service design refers to the specification and construction of technically web-based processes that deliver valuable service capabilities to customers. The experience of dealing with a smooth and well service design can directly influence customer acceptance in a very positive way (e.g., easy format and process design) [11][12][13]. In addition, website design quality is important as it is an interface channel between users and the electronic service system and attracts online users to visit the websites. Technical support quality is one major factor that supports the electronic service to perform efficiently. Finally, customer service quality has to include both online and interpersonal service.

In many cases, consumers may not purchase product or service, even if they perceive a high service quality value in a product or service. High perceived risk related to purchase product or service is important in consumption or adoption decision. Risk is commonly conceived as an uncertainty regarding possible negative consequences of using a product or service. Marketing scholars have proposed multiple types of risks, including financial, psychological, performance, physical, and social risk [4]. Perceived risk has the impact on electronic service acceptance. Studies related to electronic commerce indicate that perceived risk is a main barrier towards acceptance [1][3][5]. High risk in the Internet technology environment is a major concern, mostly because of security and privacy. Featherman and Pavlou [3] find five indicators of electronic service risk: psychological, financial, privacy, performance, and time risk.

This research explores the importance of five risk facets that adversely affect the e-government service value adapted from the review of the literature: performance risk (a risk that the service will not work as expected), privacy risk (a risk that user’s personal information may be misused), financial risk (a risk that users may have to pay more money), time risk (a risk that wastes time of the user as a result of making a wrong decision), and social risk (the potential change of status in one’s social group as the result of adopting a product or service).

3. Methodology

This research conducts a qualitative study to explore the determinants of service quality and risk dimensions of e-government service. A face-to-face in-depth interview is used to obtain a better initial understanding and to identify these concepts [6][7]. A total of 30 income tax payers are interviewed. They are all selected by judgment sampling to cover a range of occupations, e.g., bankers, accountants, marketers, engineers, dentists, physicians, and pharmacists.

4. Findings and Discussion

E-service quality value

The findings from the content analysis review that the service design of the e-revenue system provides valuable system. The interviewees who have experience filing personal income tax via the Internet think that on-line tax payment is fast, convenient and easy to use. There is no need to go to the Revenue Department office or branch to pay for tax. Even those who have not had any experience with on-line tax payment agree with this. Following are comments from the interviewees:

“Easy to use as it's similar to the form I had used. The online format is clear and nice.”

“Even those who never use this system and those who are not familiar with the Internet can use the system easily.”

In addition, the e-revenue system provides incentive to use. This service design can motivate the tax payers to use the system with faster tax refund. Besides less complication and incentive of the e-revenue service design, tax payers feel that this system also provide variety of services such as personal tax, corporate tax, and value added or sales tax filing. The following quotes from tax payers represent this view:

“The e-Revenue users said that the advantage of e-Revenue is the fact that the tax return is made very quickly.”

“The tax return is received in no time.”
However, e-revenue system does not provide customized service to tax payers. For instance, each occupation has specific conditions to file the personal income tax and some professions are more complicated in filing and calculating income tax. One e-revenue user criticizes that:

“It's much better to provide customized income tax filing, e.g., tax filing for each profession, tax filing for tax payers who have many types of income.”
“I can not use the e-Revenue as I need to calculate complicated tax or pay for extra tax.”

In addition, the in-depth interviews suggest that the website design of the e-revenue system has good quality of design. Electronic service providers should pay attention to this aspect because it creates value to the users in terms of quality information, interface, and aesthetic. One interviewee believes that e-revenue system should be accurate, and also be able to search for required information. For example, the personal tax payers highlight the importance of website quality of the e-revenue system as following:

“It's easy to read. Website’s color is also nice. I’m able to find information I want and understand how to use.”
“The texts on the website are clear. Website design is good.”
“The website is well-organized. It is good comparing to other governmental organizations’ websites. The information is more updated and can be found easily. It's easy to find relevant data, e.g. there are samples of tax paying process.”

Although many tax payers feel satisfied with the website quality, some interviewees mention the weak point of the website design of the current e-revenue system. The following quotes from respondents are representative of this viewpoint:

“In general, it's good. There should be more links to related information.”
“The letters are a bit small. I can’t find all the information I look for.”

Additionally, this study finds technology support quality as one important determinant of electronic service, consistent with previous study. Notably, many respondents have expressed concern regarding the slow access system and reliability. The following statements highlight this issue:

“I used to have problems paying tax on-line. The system was very slow when there were many people accessing the system.” (u11)
“I can download very quickly. For good quality technical system, the e-Revenue should have the technical support for high volume transactions, especially the last week of March, which is the last week for filing income tax.” (u15)
“The e-revenue system is important because it stores all income data, the Revenue department needs to have the good backup system.” (u2)

E-revenue users feel that the system should have a higher degree of responsiveness to online tax payers. Electronic service provider should pay careful attention to customer support aspects in terms of online and interpersonal support. For instance, one respondent mentions that:

“I am not sure that the tax filing is completely accepted, do I need to send more document or payment? Besides e-mail response, it will make online users feel better if the system provides a feedback to us whether the tax payment transaction is correct so that we do not have to worry.”

Perceived risk concern
The study has found out that perceived risk is a crucial determinant that decreases e-government service value. The impact of perceived risk is likelihood of adverse acceptance. The two groups perceive risk at different levels. Internet-based tax payers believe that e-revenue system has some level of performance reliability. In contrast, non-Internet based income tax payers are not sure about filing tax payment transactions via the Internet, and they perceive e-revenue system as highly untrustworthy. The following statements illustrate these points:
“I am quite confident. I believe the system have been carefully designed, tested and ready to be used on-line. Otherwise, there will be many problems.”
“For the confidence on data such as income/figures, payment transfer and calculation, I think if the data provided are accurate, the calculation should be accurate.”

Regarding the risk of using e-Revenue, many e-revenue income tax payers are rather confident in the system. They believe that the system has been developed for sometime. It can be used easily and information can be filled quickly. Tax calculation is made correctly. Still, they do have some concern of privacy risk. Some are not sure if their personal data will be kept confidential. Moreover, e-revenue tax payers have to be responsible in keeping all the income documents in case of future audit from the Revenue Department, as shown in the following statements:

“I am not sure if my personal data will be kept private. There are many people who have access to the information.”
“I don’t like to pay tax via the e-Revenue system because I have to keep all the income documents with me for 5 years. Currently, I pay tax and submit the income documents at the e-revenue department, no responsibility for keeping the document.”

Concerning the possibility of being audited, e-revenue users seem to consider this issue as relatively unimportant. Many interviewees agree that tax payment via the e-revenue can also be audited like paying tax at the Revenue Department office or branches. For non-users, the concerns of the policy of online post audit of the income tax payment had the highest frequency of mentions, indicating that this is one of the perceived financial risks of e-revenue adoption. The following statement demonstrates these issues for non-users:

“The on-line payment provides us with reference documents. In case there is any request for back duty, there will be an audit for sure.”
“There will be more audits for the on-line tax payment. And I’m not sure if it will be fair enough as there is no any electronic payment tax law support the e-revenue system.”

Most of the in-depth interviewees are those who frequently use computer and Internet for information search and e-mail, and therefore tax payers do not feel that time risk is a barrier for e-revenue adoption. E-revenue users feel the system is not too difficult to use and have to spend much time on filing the income tax. When the e-revenue system does not work, tax payers can use the interpersonal service from the branch. There is no penalty for failing to file the tax payment via the web. The following statements support the lack of time risk in e-government service:

On-line tax paying is convenient, it’s much easier and faster.”
“We can pay tax from home or office. No need to go to the local office. No queuing, or need to be upset with the staff, except when the e-revenue system fails.”

Additionally, the in-depth interview shows that e-revenue adoption does not create social risk. In the e-revenue context, this study excludes social risk as adoption of e-revenue service as it does not change the social status of the users. It is possible that paying income tax has less involvement among friends or peers. It is mostly related to personal financial information and has less interpersonal information sharing. In addition, non e-revenue users feel that they do not feel embarrassed for not using e-revenue or being low technology service oriented. One non-user income tax payer mentions:

“I don’t use e-revenue and don’t think that e-revenue adoption will create social risk. Normally, I never disclose my income to others.”

5. Conclusion

The first component of e-government service quality is service design quality. The service design quality is comprised of four items related to variety of service, uncomplicated service processes, easy to use format, incentive to use, and customized service design. The second component is website design quality. Website design quality refers to aesthetic of website design, understandable term, information linkage and searching, highlighted of new information. Technical support covers technology architecture quality that supports security, high transaction volume, speed, and backup of
data. Finally, customer support factor is related to prompt online feedback after transaction submission, online helpdesk, and provide speedy interpersonal service to resolve customer problems.

Secondly, this study identifies the various dimensions of perceived risk that affect the value of e-government service, which in turn are adversely related to citizen service adoption intention. Perceived risk is one of the most frequently cited reasons by online users for not making transactions on the Internet channel. This study shows three types of risks in e-government service: performance risk, privacy, and financial audit risk. The performance risk comprises three issues related to reliability, ability to save the tax filing transaction for future usage or editing, and risk of the system being hacked. Privacy risk is related to privacy of personal data, misuse of data by the e-service provider, and the taxpayer’s burden of keeping all the income documents for five years. Finally, financial audit risk factor covers the risk of being audited easily, tax liability in case of additional future audit, and no specific electronic commerce law for e-revenue service.

While the dimensions shows several electronic service quality and perceived risk aspects that are previously identified and studied, the findings of this study do have some unique characteristics related to the e-government service setting. E-government service providers need to optimize of e-government service value by enhancing e-service quality and lowering risk of e-government service.

6. Implications and limitations
The electronic service quality measure developed in this study is designed to provide an effective tool to measure electronic service through the whole service chain starting from service design, channel or website design, technical and customer support. E-government service providers can use the research model to detect service quality strengths and weaknesses. The quality assessment can assist in allocating resources to important service quality issues uncovered by this study, since these factors have strong relationships with adoption acceptance and future usage intention of the e-government service users. Further, as customers become accustomed to technology in their lives, most customers are unlikely to prefer the extreme of only interpersonal service without any Internet options. However, few are likely to prefer only Internet, either, with no possibility of ever dealing with people, especially in Asia’s culture which is oriented towards personal relationships. This indicates that service channel integration should be a key concern when e-government service is implemented. To create e-government service value requires bringing about technology investment and support into the whole service development process. Thinking about the structural design and management of the network and Internet technology cannot be separated from the overall service system.

In addition, this study suggests that perceived risk of e-government service can delay the adoption. Personal income tax payers perceived financial risk as post audit and fair legal support for future tax payment audit. This seems the combination of financial and psychological risk perceived by the respondents. Psychological risk arises from potentially negative outcome from having e-revenue transactions via the Internet. E-government service providers need to include perceived risk of users in the checklist for e-government project value assessment. The negative perceptions arising from perceived risk of e-government service may influence future intention to use e-government service. Government agencies should communicate with citizens with reasonable and fair policies, guarantee safety, technological reliability and service quality in order to inspire trust in electronic service and retain current users to employ e-government service. If the perceived e-government service quality is high enough, non-users may be willing to take a reasonable risk to obtain the desired value. To decrease customers’ anxiety concerning whether the tax filing transaction has been accepted, the Revenue Department should develop the e-government service tracking system for citizens to check the status of the tax payment. This solution will enable personal income tax payers to shift their decision from unwilling to use to more trust and willing to adopt as the higher value creation of the e-government service development. Future research can expand the results to other group of tax payers such as corporate taxpayers associated with the e-service quality, trust, and organization culture concepts.

References


E-governance in Japan: Analysis of the Current Status of e-government and Local e-services

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Abstract

This paper gives an overview on e-government and local e-services in Japan, developed under the guidelines contained in the e-Japan Strategy (2000) and in the New IT Strategy (2006).

We present an analysis on the current state of e-government and the challenges the country faces in order to become a worldwide front-runner, as established by the New IT Strategy.

The conclusion of the paper is that continuous efforts are necessary in order to improve e-services in Japan. Among all, citizens need increased security in their transactions in order to overcome the detected lack of engagement in the usage of e-services.

Keywords: E-governance, e-government, e-services, e-Japan Strategy, Japanese New IT Reform Strategy.

1. Introduction

E-government in Japan was developed initially under the guidelines given by the e-Japan Strategy (2000). From the beginning the idea of e-government as an enabler for the reform of the public administration was stated. This e-government environment included the transactions between governments (G2G), between the government and the citizens (G2C) and between the government and the businesses (G2B) in a national and in a local scope: “An electronic government is a means to comprehensively reform public administration. Under an electronic government, administrative transactions among government offices or between governments and citizens/businesses that have been conducted on a document and/or meeting basis will be made available online, and information will be shared and utilized instantly across various central and local government offices through information networks. This, however, does not mean just putting the existing public administrative services online. Rather, it requires carefully planned investment from medium- and long-term viewpoints and involves essential reform of administrative works, streamlining of redundant works and projects undertaken by different ministries and agencies, and revisions of relevant systems and laws. Namely, it is necessary to make public administration simpler and more efficient, and lessen the burdens on citizens and businesses.” [4]

The New IT Reform Strategy established a defined set of policies for improving e-government, in line with the goal of fully using the IT capabilities in order to provide better quality of life for the citizens, and based on the acquired experience in the implementation of e-government.

This research paper gives an overview on the local e-services and how they are understood by the New IT Reform Strategy, first comparing its goals for E-Government, with those that were established by the E-Japan Strategy. The experience in the development of E-Services at the local level will be used to present the challenges that Japan must face in the implementation process. The last part of this research paper will explain the mechanisms for monitoring E-Services.

2. The New IT Reform Strategy (2006-2010): Beyond the e-Japan Strategy

The New IT Reform Strategy – Realizing Ubiquitous and Universal Network Society Where Everyone Can Enjoy the Benefits of IT – [5] was issued by the IT Strategic Headquarters in January 2006. It intends to continue with the efforts first established by the e-Japan Strategy (2001-2005) in order to transform Japan in the most advanced IT country in the world: “The goals of this strategy are the realization of the Ubiquitous Network Society that anyone can use at any time from anywhere for any purpose, and through such a society to maintain Japan’s status as a cutting-edge IT nation with the world’s most advanced infrastructure, markets, and technical environments to improve and reform lifestyles.
from the perspective of the general public”. [5, p.18].

Almost eight years have passed since the e-Japan Strategy was issued. In this period of time, among other goals, Japan has considerably developed its broadband infrastructure, allowing users to have the fastest Internet connections worldwide at the cheapest rate (Figure 1).

According to the government, “During the past five years since the e-Japan Strategy was first unveiled, Japan has become the world’s most advanced IT nation, and the remarkable results achieved have included, the development and utilization of one of the world’s most advanced broadband infrastructures; the world’s leading usage of sophisticated mobile phones; and the development of an environment for e-commerce and its expansion into one of the world’s largest e-commerce markets. In addition, during the process in which we were working toward the realization of these achievements, we have achieved extremely positive results in the development of a mechanism for the further expansion of IT utilization in our country, such as public-private partnership and the establishment of an assessment system concerning our IT strategy” [5, p.3]. This opinion needs to be contrasted with the critics to this program, which are presented in section 6 of this paper.

After focusing basically on the infrastructure deployment, the second stage of the Japanese IT strategy seeks to carry out the necessary reforms “…to continue economic prosperity and quality of life for the people…into the 21st century…”, [5, p.6] using the IT technologies: “The issue to which we next need to focus our attention in this new strategy is to work on carrying out the reforms utilizing information technologies as well as to work to develop the necessary infrastructure for these technologies”. [5, p.4] (Figure 2)
The priority IT policies in the New IT Reform Strategy have been divided into three categories (Appendix 1), each one with specific measures to be taken. Those related to e-government are included into the first policy: “Resolution by the use of IT of various problems confronting Japan through the pursuit of IT structural reform capabilities.”

When comparing the main target for the development of e-government in the e-Japan Strategy and in the New IT Reform, the former seek to “realize an electronic government, which handles electronic information in the same manner as paper-based information…and even expedite digitization of citizens and businesses widely. Public administration should be intensively reformed to digitize documents, promote paperless, and share and utilize information through information networks” [4], while the latter seeks to achieve “The world’s most convenient and efficient e-Government —Handling of 50% or more of all filings online and creating a small and efficient government— by year 2010. <The specific target is to “Create e-Government (on the national and local government levels) that provide a sense of convenience and enhanced services and process at least 50% of applications and filings online by both national and local government by FY 2010.”> [5, p.32]

3. E-services Implementation: The Role of the Chief Information Officer (CIO), the CIO Council and the Council of Assistant CIOs (Technical Advisers to CIO) in the Promotion of e-government

E-services in Japan are implemented with the aim of integrating both the national and the local level, in order to provide a convenient e-government. After an analysis carried out by the Government following the guidelines of the National IT Headquarters, the involved ministries (national level) or municipalities (local level) start the implementation phase.

In order to carry out this process smoothly, the introduction of the Chief Information Officer role in the Japanese Government was mandated by the e-Japan Strategy. In 2002 the CIO Council was created in order to “realize E-Government”. According to Concon [2, p.30-33], every Ministry has a CIO, with the following responsibilities:

1. Chief Officer of e-government and enterprise architecture
2. Technical officer of e-procurement
3. Agency’s expert in IT security
4. Planner of IT budget
(5) Communicator and in charge of public relations
(6) Promoter of business process reengineering (BPR) and IT solution management
(7) Chief Officer in formulating strategy
(8) Chief Officer of performance assessment

This same author describes the CIO in the following terms: “…it was set up in 2002 under the ICT Strategy Headquarters. The council is identified as one of the enabling apparatus of the program, which will push forward various e-government measures in an integrated manner among ministries and agencies. All the important policies of e-Government initiatives in principle have to go through the Council. It is composed of all the Ministry CIOs. The Council is headed by the Assistant Chief Cabinet Secretary, and managed in cooperation with the Administrative Bureau of the Ministry of Internal Affairs and Communications (MIC). Under the CIO Council, a managing committee is formed of Division Directors representing respective Ministries. The formal chair is a Councilor of the Cabinet Secretariat, and the deputy chair is the Director of Administrative Information Systems Planning Division of Administrative Management Bureau, MIC. [2, p.31]

The role of the private sector in the promotion of the utilization of IT in Japan is underscored by the appointment of Technical Advisers to CIO who compose the Council of Assistant CIOs.

Experts from the private sectors were appointed by December 2003 in each Ministry and Agency. The missions of these appointees is to support their respective Ministry CIO in business analysis and formulating plans that will optimize existing programs, or what they call the Optimization Plan. They also hold inter-ministerial meeting to share the experiences of respective Ministries and discuss technical matters. As a group, they serve as the Assistant CIOs of the whole Government, not just of their respective Ministries. [2, p.32] (Figure 3)

“As such, the meetings of these Technical Advisors have become a clearance gateway as far as the technical aspects of e-Government initiatives in Japan are concerned. Various policy reviews and optimization plans go through peer review by the meeting of Assistant CIOs before going to a CIO council meeting for decision. At the top level, the ICT Headquarters, an expert member was also appointed in December 2003 too attend the meetings of CIO Council. He also serves as the chair of the meetings of Council of Assistant CIOs.” [2, p.33]

4. Current Status of e-government (Local Level)

Further improvement of e-government according to the New IT Strategy is based on the following goals, which were already achieved [8, p.81]:

![Ministerial CIO Council Diagram](image)

Figure 3: Structure of the Ministerial CIO Council. Elaborated by Professor Toshio Obi
1. Set up of an in-house LAN and provision of one computer per person: In-house LAN has been set up in 2,437 organizations (98.9%). As of April 1, 2005, each organization had 498.1 computers.

2. Set up a Local Government Wide Area Network (LGWAN): LGWAN is a dedicated network linking local governments together to enable safe and secure mail, document exchange and information sharing, as well as joint usage of a wide range of administrative systems. All local governments were connected by the end of Fiscal Year 2003: In Prefectures and designated major cities, operation started in October 2001, while all municipalities were connected by Fiscal Year 2003. As for the access to the Kasumigaseki WAN, the functionality for E-mail started in April 2002, while document exchange started in July 2002. (Figure 4)

3. Set up a Resident Basic Register Network System: Introduced on August 5, 2005. The Residents Register Network serves as a nationwide personal identification system shared by all local government bodies. It links up details of the residents register, which are used for authentication of residential status in a range of administrative procedures and processes. Information stored on the Network includes, name, address, date of birth and gender, as well as the residents register code. The issuance of basic registry IC Cards started on August 25, 2003.

4. Start offering Public Authentication Services for Individuals (JPKI): Inaugurated in January 29, 2004. As of April 1, 2006 it was offered at 11 ministries and 47 prefecture governments. (Figure 5)

5. Start up electronic application: Introduced in 39 organizations out of a total of 47 prefecture governments. As of...
August 20, 2005, forty five organizations… offer(ed) services by the end of Fiscal Year 2006.

6. Information security and protection of personal information: Guaranteed by laws for (the) protection of personal information and information security.

5. Tools for Monitoring E-Government Services

Currently, CIO and technical advisers to CIO from the Japanese Government are using mainly Enterprise Resource Planning (ERP) and Enterprise Architecture as tools for monitoring e-government services and evaluating their productivity and efficiency.

In the case of Enterprise Architecture, this is a design method that aims to optimize operation throughout an entire organization. In EA, administrative operations and systems are divided into 4 strata: 1. Business Architecture; 2. Data Architecture; 3. Applications Architecture; and, 4. Technology Architecture. Joint use of information is promoted throughout the governmental office, eliminating vertically and compartmentalized bureaucracy. [8, p.83]

One of the policies of the New IT Reform Strategy is to "establish under the IT Strategic Headquarters an E-Government Evaluation Committee (tentative name) made up of external experts who are well acquainted with the use of IT for operational reform to conduct rigorous audits and evaluations including evaluations from the perspective of cost effectiveness with respect to the optimization of operations and information systems in each government ministry, provide the necessary support and make recommendations concerning information system planning, development, operation, and evaluation, and evaluate the status of PMO [Program Management Office] activities in each ministry”.

From the side of research institutions, Waseda University has been carrying out an assessment on e-government development status for many countries since year 2004. This survey is the first of its kind in Asia and evaluates the status of e-government by comparing its actual development worldwide with what can be considered an ideal e-government situation. Waseda University has also established a Global Education Network implementing a CIO program based on a Global Human Resource Development Plan. In doing so, Waseda University faces the need of developing CIO activities in e-government with the creation of a model of CIO with world class standard. The mechanism to establish a post-graduate level curriculum for CIO training is based on the collaboration among government, business and academia.

6. Challenges Faced by Japan in Implementing e-services

The main challenge Japan has to face with respect to its e-services is the reduced citizen engagement and indifference towards them [6]. An analysis on the status of e-government made by the Ministry of Internal Affairs and Communications (MIC) found out that people and companies do not actively use the e-government. Additionally, the e-government service system was not deployed enough to connect the services to local governments, meaning that the user does not feel the convenience of e-government. Although the optimal use of work/system is tried, the system is not fully prepared. [8]

MIC conducted a survey in order to find the cause for the low level of usage of e-services. The Ministry found out that citizens are reluctant to use e-services mainly because user certification and preliminary registration of identification is required, also because users are afraid of leakage of their personal information. [8]

Another issue is the need of a citizen centric view when providing e-services: “As we look back, the e-Japan initiative has operated too much from the viewpoint of the supply-side, and therefore, it was not always in sync with the needs and requirements of the Japanese citizens” says Takuya Hirai, Japan’s Parliamentary Secretary of the Cabinet Office. “Honestly speaking, it is very difficult to force people to use the Internet—and if we abolish the paper bases, it would force people. That means that what we have is a very steady and continuous stream of public relations and publicity in order to educate the people. I think that the way to have very convenient and easy-to-understand services for the citizen is by reducing the costs or fees they have to pay.” [1, 7]

7. Conclusion

Each country has a particular approach when establishing e-services inside an e-government program. The Japanese case shows how e-government can be successfully implemented with a clear strategy and goals, as well as assuring an
adequate leadership for the process. The problems that Japan faces, namely, the lack of usage of provided e-services, as well as the low citizen engagement will be gradually solved with the continuous commitment of the involved stakeholders, under the New IT Strategy.

8. Acknowledgments

This research paper is based on the Roundtable Discussion – Video Conference held on November 16th 2007 between Waseda University (Japan), Dresden University of Technology [Technische Universität Dresden] (Germany) and Saint-Petersburg State University (Russia). The authors would like to thank the additional comments and feedback given by Ms. Hai Nguyen and Ms. Diana Ishmatova (Graduate School of Global Information and Telecommunication Studies, GITS, Waseda University).

9. Appendices

Appendix 1: Utilization of online services during 2006 (local level)

<table>
<thead>
<tr>
<th>Services</th>
<th>Annual utilization (accumulated performance) (million)</th>
<th>Rate of utilization</th>
<th>No. of institutions conducting online services</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Reservation of book lending in libraries</td>
<td>160.08</td>
<td>18.2%</td>
<td>575</td>
</tr>
<tr>
<td>2 Reservation of cultural/sports facilities</td>
<td>160.08</td>
<td>30.1%</td>
<td>465</td>
</tr>
<tr>
<td>3 Request of picking up large wastes</td>
<td>53.63</td>
<td>1.7%</td>
<td>94</td>
</tr>
<tr>
<td>4 Application of tap water</td>
<td>13.87</td>
<td>1.1%</td>
<td>308</td>
</tr>
<tr>
<td>5 Electronic filling of local taxes (eLTAX)</td>
<td>5.74</td>
<td>0.8%</td>
<td>63</td>
</tr>
<tr>
<td>6 Application of prequalification for participating in bidding</td>
<td>4.45</td>
<td>13.2%</td>
<td>245</td>
</tr>
<tr>
<td>7 Application for use of road</td>
<td>3.11</td>
<td>5.4%</td>
<td>85</td>
</tr>
<tr>
<td>8 Application for participation in lecture or other events</td>
<td>7.37</td>
<td>1.5%</td>
<td>169</td>
</tr>
<tr>
<td>9 Application for installation of water purifier</td>
<td>0.84</td>
<td>0.2%</td>
<td>62</td>
</tr>
<tr>
<td>10 Bidding</td>
<td>1.39</td>
<td>16.0%</td>
<td>234</td>
</tr>
<tr>
<td>11 Disposal and transportation history of industrial wastes</td>
<td>1.53</td>
<td>0.07%</td>
<td>28</td>
</tr>
<tr>
<td>12 Registration of pets</td>
<td>1.31</td>
<td>0.03%</td>
<td>496</td>
</tr>
<tr>
<td>13 Filing of address change of car owner</td>
<td>1.44</td>
<td>2.0%</td>
<td>29</td>
</tr>
<tr>
<td>14 Harbor related services</td>
<td>1.28</td>
<td>25.6%</td>
<td>51</td>
</tr>
<tr>
<td>15 Registration of test for recruiting employees</td>
<td>0.62</td>
<td>7.8%</td>
<td>174</td>
</tr>
<tr>
<td>16 Application for public opening of public letter</td>
<td>0.25</td>
<td>3.7%</td>
<td>265</td>
</tr>
<tr>
<td>17 Research and report on infectious disease</td>
<td>0.27</td>
<td>0.7%</td>
<td>18</td>
</tr>
<tr>
<td>18 Filing on food management</td>
<td>0.54</td>
<td>0.03%</td>
<td>24</td>
</tr>
<tr>
<td>19 Filing on disposal of specific chemical substances</td>
<td>0.12</td>
<td>8.6%</td>
<td>47</td>
</tr>
<tr>
<td>20 Application for names of sponsors</td>
<td>0.10</td>
<td>0.1%</td>
<td>49</td>
</tr>
<tr>
<td>21 Application for protection from organized crime</td>
<td>0.11</td>
<td>0.03%</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>364.10</td>
<td>17.5%</td>
<td></td>
</tr>
</tbody>
</table>

Note: The number of annual services performed is estimated through the sum of services by all local governments. The online utilization is calculated by subtracting the local services used from the national utilization number. Source: Domoyoshi Inoue, [3]

Appendix 2: The IT New Reform Strategy Resolution by the use of IT of various problems confronting Japan through the pursuit of IT structural reform capabilities

1. Measures using IT intended to resolve issues confronting Japan in the twenty-first century in advance of other countries
   - Structural reform of healthcare through IT
   - An environmentally-friendly society that utilizes IT

2. Measures designed to create a society in which people can live safely and securely
   - A world-leading safe and secure society
   - The world’s safest road traffic environment

3. Measures to promote effective and meaningful activities by government, business, and individuals
   - The world’s most convenient and efficient e-Government
**Development of the foundations for the support of IT structural reform capabilities and for the creation of the Ubiquitous Network Society**

<table>
<thead>
<tr>
<th>Measures</th>
<th>Details</th>
</tr>
</thead>
</table>
| 1. Measures for the creation of an IT society with no disparities in information levels and for the advancement of ubiquitous networks. | - An IT society that adopts universal design  
- Development of infrastructure that can be used anytime, anywhere, for anything, and by anyone and that has no digital divide |
| 2. Measures intended to create environments that allow for the safe use of IT | - The world’s most secure IT society |
| 3. Measures to promote human resource development that will support the foundations of the IT society | - Development of human resource bases with an eye towards the next generation  
- Development of high-level IT human resources that are competent anywhere in the world |
| 4. Measures for Japan to lead the world in the research and development that will support IT societies | - Promotion of the research and development that will form the foundations for the next-generation IT society |

**International contributions through the transmission from Japan to the rest of the world of the results achieved through the pursuit of IT structural reform capabilities and the development of the infrastructure that will support those capabilities**

<table>
<thead>
<tr>
<th>Measures</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Measures to enhance the presence of Japan in international competitive society</td>
<td></td>
</tr>
<tr>
<td>2. Measures to make contributions to other Asian countries by providing problem-solving models</td>
<td></td>
</tr>
</tbody>
</table>

Source: IT Strategic Headquarters. [5]

**References**

eGovernment Interoperability Issues in Lithuania

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Abstract
The paper analyzes the interoperability importance and role in development of eGovernment. The interoperability challenges was faced in different EU countries since 2000. System complexity, multiplicity and diversity in the public sector is posing extreme challenges to common interoperability standards the eGovernment Interoperability Frameworks (eGIFs) pose as a cornerstone for the provision of one-stop, fully electronic services to businesses and citizens. The paper analyzes eGovernment development preconditions in Lithuania, overview and good practice experience in developing eGovernment interoperability framework at EU level (European Interoperability Framework) and national levels – UK, Germany and Greece. Comparing these frameworks by different criteria the guidelines for developing eGovernment interoperability framework in Lithuania are designed. The project for Lithuania eGovernment Interoperability framework development is supported by Ministry of Interior of the Republic of Lithuania and State Science Fundation.

Keywords: Interoperability, eGovernment, Framework, Lithuania

1. Introduction
In the beginning of 21st century citizens’ expectations and new laws and regulations requires that information need only be given once and need to be reused by others create a huge need for interoperability among public and private organizations. All these organization comprise hundreds, thousands, or even more applications that need to communicate with each other.

Interoperability is not a new concept in the domain of computer systems. Interoperability of computer system is defined by IEEE as “the ability of two or more systems or components to exchange information and to use the information that has been exchanged” [10]. Electronic dictionaries define interoperability as “The ability of software and hardware on multiple machines from multiple vendors to communicate”. For the purposes of this study, we define interoperability as: The ability of distinct systems to communicate and share semantically compatible information, perform compatible transactions, and interact in ways that support compatible business processes to enable their users to perform desired tasks. [15] Although our definition of interoperability was derived from a technical perspective, it applies to all aspects of eGovernment, if “system” is interpreted broadly. Note that this broad definition implies that an IF is far more than just a list of recommended standards.

From the early days of eGovernment, interoperability was perceived as a critical challenge and enabler. Interoperability has a central role in eGovernment and as a result significant work has been already conducted. Since 1991, interoperability has remained an important EU goal – especially in the eGovernment context. To take one particularly pertinent example, in June 2002 the eEurope 2005 Action Plan made the development of a European Interoperability Framework (EIF) a priority component of pan-European eGovernment strategy. [14]

Broad-based IT interoperability is vital to the fulfillment of the Information Society’s enormous potential to enrich the lives of citizens in Europe and beyond. Interoperability plays this role by ensuring that consumers have the ability to access and use a diverse range of technology products and services. Interoperable products provide consumers with meaningful choice among vendors, as well as with increased functionality, enabling consumers to construct systems that meet their specific needs from a variety of vendors, incorporating hardware (microprocessors, memory and storage media, printers, screens, etc), software elements (operating systems, middleware, data management tools, applications etc) and related services. In this way, interoperability reduces ICT integration costs, improves efficiencies, enhances business productivity and facilitates the adoption of new and emerging technologies.

By needing to reuse information Interoperability is an important issue for all types of government, including policy making, services delivery, law enforcement and crisis response. Police departments, health and safety departments, and first responders need to be able to communicate during wide-scale emergencies. In the past, agencies could not
exchange information because they operated widely disparate hardware that was incompatible. With the advent of the Internet, a communication infrastructure has been created and with the rise of Service-Oriented Architectures (SOA) and web services as technology, the technology threshold for interoperability has been lowered. As more business and governmental systems can be accessed using web services, research emphasis is shifting to the coordination of web services invocations, thus from enhancing interoperability at the data exchange level to the business process level [20].

The obstacles, which prevent a rapid progress into that direction, are not merely technical. In fact, the technology side may prove the least difficult to address, while the organizational, legal, political, and social aspects may prove much more of a challenge [11], [17].

System complexity, multiplicity and diversity in the public sector is posing extreme challenges to common interoperability standards the eGovernment Interoperability Frameworks (eGIFs) pose as a cornerstone for the provision of one-stop, fully electronic services to businesses and citizens. Such interoperability frameworks aim at outlining the essential prerequisites for joined-up and web-enabled Pan-European e-Government Services (PEGS), covering their definition and deployment over thousands of front-office and back-office systems in an ever extending set of public administration organisations.

2. eGovernment Interoperability in Lithuania

The Lithuanian eGovernment strategy is laid down in the Position Paper on eGovernment adopted by the government on 31 December 2002. The ultimate goal is to improve transparency of the decision making process of the executive bodies of the Republic of Lithuania in order to deliver high quality public services efficiently and provide information to the public, businesses and institutions. For this purpose, possibilities offered by information technology are necessary.

In this context, the Information Society Development Committee established a working group on interoperability of the information systems of the State. One of the most important Lithuanian IT projects is the creation of system interaction capabilities through public administration institutions interoperability. [12]

Approximately 126 million Litas (36 million euro) of EU structural funds and national co-financing aid for Lithuania’s information society for the period 2004-2006 will be spent for projects related to electronic government. Tender “Electronic government and eServices” which aims to create possibilities for all citizens and businesses of Lithuania to use ICT for communication with public institutions and to modernize services of public sector includes projects subgroup “Interoperability”. The goal of these projects is to achieve interoperability of the public sector information kept in public institutions’ information systems, as far as it is permitted by legislation.

On the basis of the model created for electronic public services in October 2004, a pilot project “Development of portal functional and technical infrastructure and services” was started. After this project, public service “announcement of movement” and all related services will be transferred onto the Internet. Possibilities to implement other public services on the basis of “one-stop-shop” will be embodied. Software will ensure input of user data to the information systems of the Migration Department and the Resident’s Register Centre and will ensure review of data in the Real Estate Register.

The goals of the portal are:

- Integrated Internet access to information and public services delivered by state institutions;
- The content of portal users should be reachable by computers or mobile phones;
- A list of links to Public organizations and State institutions websites should be available on this portal; and
- All existent links in the portal should be grouped by residents and business enterprises.

The functional scheme of the eGovernment portal (see Figure 1):

- The user inputs the system query for the service. There are three cases of identification in the information system – using an existing e-banking account (private and public sector used this for 2004 for tax declarations to the Tax Inspectorate information system – 10 percent of residents), using PKI qualified (non-qualified)
certificates or mobile electronic signature (using mobile phone).

- User queries are sent to a data centre providing the functions of the front office of the eGovernment portal.
- User queries are automatically (using defined bureaucratic procedures in the database) forwarded to the institutions (decision-makers). Data needed for the decision is sent to state institutions. The queries are forwarded directly to the responsible persons of the state institutions.
- The procedures of the public services are described in the data center database. In some cases the chain of decision-making is connected to two or more state institutions or decisions of institutions are independent of each other.
- The platform of the data centre has a possibility to integrate with the back office of state institutions.
- The data centre stores and analyzes input/output data of state institutions’, and observes the realization of public services, and sends appointments to state institutions’ officers and decision makers.
- Decisions of decision makers (and/or queries of the civil servants) are signed with electronic signatures. Civil servants use electronic signatures from PKI infrastructure for closed groups.

Limitations of the present portal:

- There is no identification system of visitors implemented in this portal, without this system it is impossible to provide fully interactive electronic public services.
- The “one-stop-shop” principle is not realized. Users should only have to identify and authenticate themselves once to obtain any electronic public service independent of institution providing it.
- Electronic documents produced by civil servants now are doubled in paper and electronic form. It is impossible to ensure security and archiving of them for a defined period of time.
- It is difficult to manage newly appearing electronic public services and changes with already existing procedures.
- The bureaucratic procedures are unclear (can be also excessive) for a user that needs to know what institution provides what services.
- Complicated maintenance of the portal.

However, interoperability of information systems of state institutions is mentioned in various strategies. An electronic signature infrastructure was created and implemented. A project called “Creation of Interoperability of Public Administration Institutions’ Information Systems” was begun in 2006. The purpose of the project is to create an interoperability framework of institutions and a portal with central identification. June 2008 new project was begun which aims to develop Lithuanian eGovernment Interoperability Framework in order to provide Lithuanian government with guidelines for dealing interoperability issues at national level. But at the moment an explicit strategy for interoperability does not exist.
3. eGovernement Interoperability Frameworks in Europe

Because eGovernment interoperability frameworks are still a relatively new concept, there are not yet many examples to choose from, and most of those that exist appear to be well known.

Nowadays, building an e-Government Interoperability Framework must oppose the tendency to “reinvent the wheel” and requires examination and extended review of related research and standardization efforts [5] in the EU, the UK, Germany, Greece and other EU countries (see Figure 2).

![Figure 2. eGIFs in European Union](image)

This paper presents comparison of best practice in implementation of eGovernment interoperability frameworks according certain criteria in following countries:

- At European level, the European Interoperability Framework – EIF (Version 1.0) [8].
- Germanys’ Standards and Architectures for e-Government Applications (SAGA) Version 3.0. [12]
- Greece and its’ new Greek e-Government Service Provision and Interoperability Framework [18].

Despite being small, this sample provided a good mix of national and EU efforts. The specific rationales for our choices were as follows. The EU EIF was a given, since it provides an overarching set of interoperability criteria (the IDABC Architecture Guidelines provide a related architectural perspective). Most national interoperability frameworks refer to the EIF as well and strive for at least partial compliance with it. The UK’s eGIF is one of the most mature (in the sense of having been around longest and having been through the most revisions) and complete of the national interoperability frameworks and is heavily referenced in other interoperability frameworks, making it a natural choice. Germanys’ SAGA is second of most mature interoperability frameworks. Greece brings to the sample ambitious and most recent effort of so called second generation interoperability framework.

The following subsections present key observations about the sample interoperability frameworks that we analysed. The intent here is not to give exhaustive analyses, but rather to highlight and contrast the most salient features and aspects of these interoperability frameworks.

### 3.1 European Interoperability Framework

The EU’s EIF and the supporting IDABC Architecture Guidelines are intended to address the interoperability of pan-European eGovernment services (PEGS). Its scope includes A2A, A2C, and A2B (where “A” stands for “Administration”, “C” for “Citizens” and “B” for “Business”).

The EIF identifies three types of PEGS interactions:

- Direct interaction between citizens or enterprises of one Member State with administrations of other Member States and/or institutions;
The exchange of data between administrations of different Member States in order to resolve cases that citizens or enterprises may raise with the administration of their own country;

The exchange of data between various EU institutions or agencies, or between an EU institution or agency and one or more administrations of Member States.

The EIF’s recommendations are quite high level, whereas the related IDABC Architecture Guidelines are very low level (mentioning many specific standards such as PKI (Public Key Infrastructure), XML (Extensible Mark-up Language), SOAP, WSDL (Web Services Description Language), etc.), thereby leaving a large gap between these two sets of specifications.

The impact of the EIF so far appears to have been rather modest, in part because PEGS have not yet appeared in significant numbers. Nevertheless, the EIF is referenced frequently in national interoperability frameworks, most of which at least claim the intention of complying with it. [4] [6] [7] [15]

3.2 eGovernment Interoperability Framework of United Kingdom

The eGIF is intended to help create interoperable systems working in a seamless and coherent way across the public sector in order to provide better services, tailored to the needs of citizen and business at a lower cost. Its scope includes G2G, G2C, G2B (UK to worldwide) (where “G” stands for “Government”, “C” for “Citizens” and “B” for “Business”), UK to EU/USA, etc.

It is one of the most mature national interoperability frameworks: its first version was published in 2001, and it had reached version 6.1 as of March 2005. It specifies the use of SOA as well as providing support, best practice guidance, toolkits, and centrally-agreed schemas (for example, involving XML). [1] [13] [15]

This framework appears today in a crossroad since it has to grow in scope in order to accommodate the different kinds of technical and process standards and adopt a newer, more business needs oriented governance regime. To date, the UK eGIF has focused on standards for interconnection, data integration, content management metadata, eServices access and channels, and standards for specific business areas, yet the interoperability problem remains. What is new now in the UK is the realisation that an open standards ‘landscape’ is but a foundation for a larger, more holistic requirement, ‘the government enterprise architecture’ and that more attention needs to be paid on the “process” and the “people” dimensions, ensuring that everything from governance to technical standards selection and mandation is business needs driven and not technology opportunity driven. [3]

The lessons from the UK experience for others embarking on creating an e-GIF are [3]:

- In order to make the leap straight into the enterprise architecture approach, each country’s e-government community must have the vision, leadership, managerial and technical capability to meet the real business need through different technologies and to work at a high level of sophistication.
- Policy makers, strategists and implementation planners must be prepared for achieving evolutionary, not revolutionary changes - a small step at a time - and keep in mind that the long haul - quick wins will seem to be small wins in the grand scheme of things. They must not pin their faith for adoption of the eGIF on penalties for non-cooperating, but should impose their will with the help of incentives to the involved organizations.
- The starting position must be well understood and benchmarked so that the gap between the 'as is' and the 'to be' states are well defined. Ongoing monitoring of change needs to be in place in order to know quantitatively what difference the effort has made. Time frames for measurable change need actually to stretch out into years.
- Winning ‘hearts and minds’ is crucial and mechanisms for increasing awareness must be foreseen. Education schemes to help people ‘get with the programme’ and become recognised 'e-government professionals' are also required.
- The supplier community must be in partnership with the government community, with a shared understanding of the means of delivery and the ends sought.

3.3 Standards and Architectures for e-Government Applications (SAGA)
In Standards and Architectures for E-Government Applications (SAGA), the German e-Government Interoperability Framework, moving from task-oriented to process-oriented Administration appears today as the key challenge to overcome. Regarding the current version of the SAGA, the Reference Model of Open Distributed Processing (RM-ODP) is not well used since standards are not appropriately associated to viewpoints and there are many aspects not yet established, e.g. the creation of an XML Data Repository which is currently under way, or not equally addressed, such as the enterprise viewpoint in comparison to the technology viewpoint. Finally, SAGA partially has too much “German / Bund Flavor” and there is not sufficient internationalization at EU level [3].

Further lessons learnt from the experience with SAGA suggest that [3]:

- Standards and technologies to be followed should be proposed in an eGIF, yet a determination on certain technologies is not necessary for achieving interoperability and should not be integrated in eGIFs since variety guarantees continuous innovation and competition and prevents market foreclosure.
- A bottom-up approach needs to be adopted covering equally all the viewpoints of the RM-ODP: technology, information, enterprise, computational and engineering. Creating patterns of standard processes and data models for similar services must be pursued.
- The continuous revises of the eGIF must be balanced between adding the latest developments and experiences (through the discussion in the public eGIF forum) and its being characterized as too complex and overregulated.

3.4 Greek e-Government Service Provision and Interoperability Framework

The new Greek e-Government Service Provision and Interoperability Framework introduces a new system (not a paper-based specification) that will interact with e-Government portals and back-office applications, guiding their evolution and ensuring interoperability by design, rework or change. The implementation addresses a number of key issues, such as:

- Development of unified governmental data models (in the direction of Core Components).
- Specification of truly interoperable, one-stop governmental services.
- Definition of standards and rules, against which Governmental sites will be constantly measured and certified.
- Adoption of protection, security and authentication mechanisms and arrangement of the corresponding legal issues.
- Change management procedures and customization techniques for applying the findings to the specific Public Administration needs and demands.

The initial application of the Greek eGIF, as well as the evolutions of the German and UK eGIF’s are indicating that new perspectives should be taken into consideration from now on, analysed as following:

- Importance and adequate effort should be put in defining standard electronic services for businesses and citizens, thus providing clear examples to administrations and service portal developers.
- The paper-based specification should give way to system-based presentation of the framework, incorporating service descriptions, data definitions, certification schemes and application metrics in a common repository.
- Organisational interoperability issues should be supported by a more concrete methodology of how to transform traditional services to electronic flows.
- The collaboration among European e-Government Interoperability Frameworks is particularly beneficial for the ongoing Frameworks, since it ensures that lessons from the pioneers’ experience are learnt and that the same mistakes will not be repeated.

Future work along the Greek eGIF includes research on the distinct frameworks complementing its first release, publication of XML Schemas based on Core Components methodology, initial training of key staff within administrations and extension of the system in order to encourage stakeholders to engage themselves and build synergies across the public sector in a truly interdisciplinary way. [3]
4. Comparison of different interoperability frameworks

The results of different eGIFs are presented bellow comparing them by interoperability dimensions addressed, layers identified, scope and interest groups. Interoperability is frequently viewed as having number of distinct dimensions. One of the earliest views of interoperability is the layered or “stack” view of interaction among computer systems over a network. The earliest popular version of this view was the traditional Open Systems Interconnect (OSI) model, here are listed layers identified by eGIFs analysed. Scope and interested groups views are concerned with the functional range of an IF. Within the broad domain of eGovernment, interoperability may be tasked with a range of different scopes.

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>Organizational interoperability</td>
<td>Only technical interoperability covered</td>
<td>Organizational interoperability</td>
<td>Organizational interoperability</td>
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<tr>
<td></td>
<td>Semantic interoperability</td>
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<td>Semantic interoperability</td>
<td>Semantic interoperability</td>
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<td>Technical interoperability</td>
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<td>Technical interoperability</td>
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<td>Political context</td>
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<td></td>
<td>Legal interoperability</td>
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<td>Layers</td>
<td>Basic Public Functions</td>
<td>Interconnectivity</td>
<td>Enterprise viewpoint</td>
<td>Systems Standards and specifications</td>
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<td></td>
<td>Secure Data Exchange</td>
<td>Data integration</td>
<td>Computational viewpoint</td>
<td>Coordination</td>
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<td></td>
<td>Aggregate Services</td>
<td>Content management</td>
<td>Technical viewpoint</td>
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<td></td>
<td>Administration, Business</td>
<td>metadata</td>
<td>Engineering viewpoint</td>
<td></td>
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<tr>
<td></td>
<td>Citizens</td>
<td>eServices access</td>
<td>Information viewpoint</td>
<td></td>
</tr>
<tr>
<td>Scope</td>
<td>Direct interaction between citizens or enterprises of one Member State with administrations of other Member States and/or institutions. The exchange of data between administrations of different Member States in order to resolve cases that citizens or enterprises may raise with the administration of their own country. The exchange of data between various EU institutions or agencies, or between an EU institution or agency and one or more administrations of Member States.</td>
<td>The e-GIF covers the exchange of information between government systems and the interactions between: UK Government and citizens UK Government and intermediaries UK Government and businesses (worldwide) UK Government organisations UK Government and other governments (UK/EC, UK/US, etc.).</td>
<td>There are three target groups for the Federal administration's services: Citizens (Government to Citizens – G2C) Companies (Government to Business – G2B) Administration (Government to Government – G2G) SAGA's scope of validity covers the federal administration and software systems with interfaces between federal authorities and federal-state and/or municipal authorities in order to support the public services.</td>
<td>Organisational aspect: 20 ministries, 13 prefectures, 52 districts, 1000 municipalities and 1000 governmental “points of service” delivering over 3000 public services. Systems aspect: 200 governmental internet portals, 1000 municipal internet portals, 2500 public administration back office systems. Non-governmental stakeholders aspect: 750 000 companies, 11 000 000 citizens, 18 000 000 tourists per year and over 20 000 000 service requests per year.</td>
</tr>
<tr>
<td>Interest groups</td>
<td>Administration policy makers responsible for eGovernment service development and operation, Administration officials responsible for ICT systems implementation (and by extension any contractors working on their behalf)</td>
<td>UK government which includes central government departments and their agencies, local government, and the wider public sector, e.g. non-departmental public bodies (NDPBs) and the National Health Service (NHS).</td>
<td>SAGA is primarily designed for decision-makers in the fields of organization, information technology and eGovernment teams in German administrations.</td>
<td>All governmental institutions in Greece.</td>
</tr>
</tbody>
</table>

7. Conclusions

Basing on the analysis of best practice interoperability framework the following recommendations might be provided towards formulating Lithuanian eGovernment Interoperability Framework:

- The framework should address organizational interoperability, semantic interoperability and technical
interoperability issues;
- The eGIF should provide high level standards (the data, technical, authentication, web portal and multi-channel access standards) for systems used in public eService provision.
- The interoperability framework should be addresses to national level institutions. The further development of eGIF should take into consideration regional and local issues;
- Representatives of governmental organizations will be the main stakeholders in development eGIF.

References

The Valence of Online Consumer Reviews and Purchase Decision: Examining the Moderating Effects of Product Type and Consumer Expertise

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Abstract

The purpose of this study is to investigate the moderating effects of product type and consumer knowledge on the relationship between online consumer reviews and purchase decision. An experiment was conducted to test the hypotheses. The results substantiate the argument that the valence of online consumer reviews impacts the consumers’ purchase decision. That is, positive online consumer reviews will have positive effect on the purchase decision while the negative online consumer reviews impact the buying decision negatively. In addition, consumers are more likely to rely on the online consumer reviews to make the purchase decision for the durable products. For the non-durable products, online consumer review is only a supplemental information source for the purchase decision. Finally, the theoretical and practical implications conclude the remark.

Keywords: Online consumer review, product type, consumer knowledge, purchase decision

1. Introduction

With the popularity of Internet and advancement in information technology, huge numbers of consumers now routinely engage in internet-based information searches and purchase transactions. To reduce uncertainty about product quality and risk regarding the seller’s credibility, consumers look for information sources such as consumer reviews on the Internet [33]. Compared with traditional marketer-provided information sources such as advertising, sales promotion or direct marketing materials, and salesperson utterances, online consumer reviews represent consumer-generated sources of information. As such, online consumer reviews are generally perceived as more credible and trustworthy information sources [10].

Increasingly, the growing importance of online consumer reviews has been acknowledged by consumers and managers alike. For example, approximately one-third of American travelers read web reviews from other travelers before making travel decisions [4]. The prospect of negative (or for that matter, positive) consumer reviews [39] as well as the reality that marketing firms may be increasingly losing control over this review process [14] holds important position to marketing managers. Given the onslaught of these online consumer reviews – which have facilitated what is commonly known as Electronic-Word of Mouth, or E-WOM [18] [31] – the number of sources available to consumers during their information searches has expanded exponentially. It is likely that some firms will benefit gracefully because they have responded strategically; while others will suffer egregiously because they failed to respond strategically. But realistically, few firms can afford to sit back and permit what happens to happen, absent any strategic and tactical intervention.

However, to date the literature has allocated limited research attention to the online consumer reviews and their impact on consumer information search behavior and business performance [14] [18] [25] [31]. Therefore, the purpose of this study is to bridge the literature gap and expand the practical body of knowledge that addresses the possible impact of online consumer reviews on consumer purchase behavior. The various factors that moderate the impact of online consumer reviews on the purchase decision such as consumer expertise and product type will be investigated and tested. This paper will be organized as follows. First of all, we will present the theoretical foundations and develop the hypotheses. Secondly, an experiment is conducted to collect the data and the results will be reported. Finally, the theoretical and managerial implications suggested by the study will be discussed.

2. Theoretical Background and Hypotheses

The phenomenon of online consumer reviews has emerged as a substitute for, and a complement to, traditional WOM communication [7]. To date, studies have investigated the role and impact of consumer motives that prompt the search for online consumer reviews [18], as well as the impact of online consumer reviews on consumer information search behaviors or online product choices [33]. The influence of online consumer reviews on purchase
intention or corporate sales performance has also been examined [7] [25] [31]. The collective outcomes of these studies have yielded various insightful suggestions and implications. Those outcomes have proven inconclusive and at times controversial. Chevalier and Mayzlin [7], for example, found that the valence of a message (i.e., the degree of positive vs. negative reviews), as an important E-WOM metric, exerts a significant impact on consumers’ purchase decisions and firms’ financial performance. But no such relationship was observed in Liu’s work [25]. In part to clarify this uncertainty, this study’s first objective is to examine the influence of online message valence on consumers’ purchase decisions. In addition, experimental research designs have been described as powerful modes from which E-WOM can be investigated [18]. Consequently, this study is based on an experiment that systematically investigates the impact of positive and negative online consumer reviews on consumer’s purchase decision.

Nguyen [27] is the only author who has proposed a conceptual framework examining the possible effects of moderating variables such as product type and consumer expertise on consumers’ belief in and usage of online consumer reviews. Nonetheless, the questions regarding whether and how product type and consumer knowledge moderate the impact of online consumer reviews on consumers’ purchase decisions remain unanswered [31]. Consequently, the second objective of this paper was to address this shortfall by examining the potential moderating effects associated with the level of consumer expertise (i.e., knowledgeable vs. novice shoppers) and product type (i.e., high involvement vs. low involvement products) on the “online consumer reviews → purchase decision” relationship.

Information search represents the stage of the decision making process wherein consumers actively seek and subsequently integrate information from internal and external sources [37]. Internal information search involves memory. External search entails examining all other relevant information not already embedded in memory [12]. Individuals such as friends and family members are important external information sources [2]. WOM originates from such individual sources. A consensus has emerged that satisfaction with a product or service can cause positive behavioral intentions such as positive WOM [11] [28] [24]. Satisfaction itself refers to, at some level, a personal judgment of the pleasurable fulfillment that results from consumption of a product/service [30]. Favorable WOM should be directly associated with such pleasant experiences. In turn, such WOM might ultimately contribute to favorable purchase intention and eventual loyalty [41].

On the other hand, negative WOM has been characterized as being reflective of a consumer’s dissatisfaction with a product or firm [34]. Unfavorable WOM provides negative information about a product, service or firm. It imposes greater influence on subsequent consumer behavior than more positive information [40] [22] [35]. Although consumers sometimes fail to make careful or accurate attributions regarding why or how a product or service came up short, they still feel confident about such inferences [15] [19] [35]. The degree of confidence in their negative inference could lead to more strongly expressed negative WOM, which may turn new customers or prospects away from the product/service or firm in question [38]. Dissatisfaction with a brand, or an entire product category, may contribute to switching behavior. Such a response would clearly impact consumers’ repurchase intentions [23]. WOM, as a mode or source of communication, has traditionally enjoyed high source credibility by both marketers and consumers because it is generally offered absent any prompting, compulsion or personal interest.

Given the popularity of Internet and proliferation of e-commerce, a new source of WOM, called online consumer reviews, is becoming increasingly dominant. Online consumer reviews provide a large amount and variety of information. They also greatly reduce the costs in time and effort that traditionally were associated with consumer information search efforts [33]. The valence (e.g., positive vs. negative characteristics) of online consumer reviews is likely an important E-WOM metric. Chevalier and Mayzlin [7] concluded that while positive online review contributed to increased book sales, incrementally more positive reviews were less powerful in increasing sales than incrementally more negative reviews were in lessening book sales. While the credibility of online consumer reviews should be further explored, one can assume that most consumers still trust their authenticity. The 2007 Edelman Trust Barometer survey showed that substantially more than half of the participants chose their peers as their most-trusted source compared to only one fifth in 2003 [50]. As a result, we speculate that negative online consumer reviews, as negative word-of-mouth, could delay the purchase decision. Therefore, we propose that:

\[ H1: \text{The positive impact of favorable online consumer reviews [on consumer purchase intentions] should prove less consequential/impactful than the negative impact of unfavorable online consumer reviews [on consumer purchase intentions].} \]
Knowledge may exercise a critical factor when consumers evaluate a product/service and make purchase decision [3]. Alba and Hutchinson [1] argue that consumer knowledge is composed of product familiarity and expertise. Familiarity is thought to capture the product-related experiences accumulated by the consumer. Consumer expertise, in turn, is thought to capture the ability to perform product-related tasks successfully. Because expert consumers possess prior information about product characteristics, they are better prepared to differentiate relevant from irrelevant information, and they may tend to rely more on their product/service knowledge and less on others’ opinion [20]. It appears possible that such experts act rationally than novices. As a result, consumer experts may be more capable of discriminating “good” (i.e., valid) from “bad” (i.e., less than valid) recommendations based on their prior knowledge and/or experience with the product/service. By comparison, novices, who know far less about a product, appear more likely to seek non-product information and consider other’s opinions particularly those opinions that are expressed negatively [16] [26] [32].

Nowadays, with the rise of the World Wide Web, far more consumers are beginning to search for information online, from sources such as blogs, chat rooms or consumer rating sites. Nysveen and Pedersen [29] found that consumers’ product knowledge positively influences their purchase intention when shopping online. While knowledgeable consumers may examine consumer reviews to look for new information about a product or service, they may not depend on this information to make a decision because they are more likely to rely on prior knowledge of the product/service to make judgments [5] [20]. Conversely, novice shoppers have no prior knowledge and experiences. Therefore, they may rely more on online consumer reviews - regardless of their valence - when making purchasing decisions. On this basis, it is proposed that:

H2: Expert shoppers should be less likely than novice shoppers to use online consumer reviews to making or seeking support for their purchase decisions.

Product type exercises substantial influence on various consumer purchasing behaviors, including their level of involvement with the product itself. Consumers’ involvement with any product or its purchase is primarily based on a combination of two factors. The first is the importance of the product to consumers. The second relates to the level of risk that consumers assign to a product [17]. The intensity of information search generally increases concomitant with increases in the levels of risk and/or importance assigned to the product by consumers [29]. Generally, consumers concurrently perceive nondurable products as less important and risky. Consequently, consumers tend to engage in less goal-oriented – or lower involvement- search behaviors when evaluating or otherwise considering nondurable goods [29].

Durable goods are more routinely classified as “high involvement” products. This difference in large part derives from the fact such products generally feature greater between-brand differences, complexity and perceived risk. Consumers tend to seek more information and examine more attributes and alternatives when evaluating durable as opposed to non-durable products [36]. Thus consumers of high involvement products may tend to search for more product information online. They may also be more likely to read more online consumer reviews in order to search out and evaluate other buyers’ opinions and suggestions. By comparison, consumers of low involvement products may be less likely to engage in extensive information search. The primary reason appears to be that such products are deemed less important and less risky by consumers. On this basis, it is hypothesized that:

H3: Consumers involved in high involvement consumption decisions should be more likely than those involved in low involvement consumption decisions to seek out online consumer reviews when making or seeking support for their purchase decisions.

3. Method and Findings

Data for this study were collected using a self-administered instrument distributed at a flagship public University. To avoid subject speculation bias about the purpose of the study, respondents were divided randomly into two independent groups. Respondents in one group were given instrument “A” where they responded on descriptions that featured negative online consumer reviews. Respondents in the second group were given a different questionnaire (i.e., “B”) where they evaluated their search and purchase behaviors based on descriptions that featured positive online consumer reviews. Two product categories - flat screen TVs and backpacks - were featured as focal products in this experiment. Each category was selected because products from each are purchase with relative frequency by the target respondents. In addition, the selected products clearly diverge in terms of the degree of their durability. Descriptions for each product were developed after an online research of consumer reviews of flat screen TVs and backpacks. Twelve doctoral and eight MBA students were asked to write down their buying
criteria for flat screen TVs and backpacks. Each hypothetical product was assigned a non-descriptive brand name (e.g., brand X or Z) to avoid preexisting perceptions or biases regarding an actual brand’s quality or attributes/characteristics.

Respondents were asked to respond to a set of seven questions capturing their perceptions of the quality of product, as described in the questionnaire. This step was conducted to ensure that respondents did, in fact, perceive the descriptions of the online consumer reviews accurately in terms of quality evaluation (i.e., manipulation check). The seven items for the manipulation check include “Brand X or Z is technically advanced, innovative, reliable, durable, prestigious, exclusive, and its overall quality is good”. Responses were assessed through 5-point Likert scales anchored between “1” (indicating strong disagreement), and “5” (indicating strong agreement). Participants were next asked whether they would buy brand X or Z based on descriptions provided in the online consumer reviews. Consumer expertise for flat-screen TVs and backpacks were measured separately by using scales from Alba and Hutchinson [1] [21]. Demographic information such as gender, age, social class was also measured.

In all, 582 respondents were asked to participate in the survey. Only 383 questionnaires were collected, however. Of these, 381 are usable (190 from group 1 and 191 from group 2). The response rate is 65.5% and usable rate is 65.8%. There were 219 male and 155 female respondents. More than 78% (300) of the participants were in the age between 18 and 25. Most of the subjects are juniors (33.3%) and seniors (42.5%), and from middle class (48.6%) and upper middle class (35.2%). In addition, 83% of respondents were from the U.S..

Independent samples t-tests were used to test for manipulation check (see Table 1). The results confirmed that the scenarios actually captured characteristics (i.e., positive or negative) that were intended to be associated with online consumer reviews. Respondents reading positive online consumer reviews assigned significantly higher ratings to high- and low-involvement products than did respondents who were exposed to negative online consumer reviews. In an extension of prior work [1], Kleiser and Mantel [21] developed and validated four dimensions presumed to capture consumer expertise. Theses dimensions were, respectively, cognitive effort/automaticity, analysis, elaboration and memory. This study adopted the 15 items of consumer expertise as proxy to measure respondents’ comparative status as either “experts” or “novices.” These items were checked for internal consistency (see Table 2), and convergent and discriminant validity (see Tables 3 and 4). All the Alpha scores exceeded .68, suggesting sufficiently high construct reliability was present. Inter-factor correlations were less than the respective Alpha scores and greater than the covariance estimates. This result infers the presence of high convergent and discriminant validity among the constructs.

To test hypothesis one, we used regression analysis to evaluate how the purchase intention in positive scenario (that is, positive online consumer reviews) will differ from that in negative scenario (that is, negative online consumer reviews). From the table 5, we can see that the product evaluations in both scenarios have significant impact on the purchase intention ($\beta_{\text{positive}} = 0.685$, and $\beta_{\text{negative}} = 0.948$; $p = 0.000$). In addition, the beta weight for product evaluation in positive scenario ($\beta_{\text{positive}} = 0.685$) is much lower than that for product evaluation in negative scenario ($\beta_{\text{negative}} = 0.948$). The results substantiate the hypothesis 1 that the positive impact of favorable reviews would prove less consequential/ impactful than the negative impact of unfavorable reviews.

Hypothesis 2 was tested using univariate data analysis (see Table 6). The result indicates significant impact of product evaluation on the consumers’ purchase intention ($p = 0.000$). For the four dimensions of consumer expertise, only elaboration is significant at 0.1 level ($p = 0.083$), while the other three dimensions (cognitive effort, analysis and memory) is not statistically significant ($P_{\text{cog}} = 0.439$, $P_{\text{ana}} = 0.731$, and $P_{\text{mem}} = 0.951$). The marginal significance of elaboration dimension implies that the consumers are likely to employ their existing knowledge to evaluate the
Table 1. Manipulation check: independent samples t-test of product evaluation for each product

<table>
<thead>
<tr>
<th>Product/Evaluation</th>
<th>Flat-screen TV</th>
<th>Back Pack</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Negative</td>
<td>Positive</td>
</tr>
<tr>
<td>Tech Advanced</td>
<td>2.44</td>
<td>3.88</td>
</tr>
<tr>
<td>Innovative</td>
<td>2.25</td>
<td>3.62</td>
</tr>
<tr>
<td>Reliable</td>
<td>3.04</td>
<td>3.60</td>
</tr>
<tr>
<td>Durable</td>
<td>3.05</td>
<td>3.32</td>
</tr>
<tr>
<td>Prestige</td>
<td>2.09</td>
<td>3.75</td>
</tr>
<tr>
<td>Exclusive</td>
<td>1.99</td>
<td>3.43</td>
</tr>
<tr>
<td>Overall Quality</td>
<td>2.96</td>
<td>3.96</td>
</tr>
</tbody>
</table>

Table 2. Internal consistency test: consumer expertise

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Flat-screen TV</th>
<th>Backpack</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Alpha</td>
<td>Mean</td>
</tr>
<tr>
<td>CE-Cognitive</td>
<td>0.79</td>
<td>2.51</td>
</tr>
<tr>
<td>CE-Analysis</td>
<td>0.69</td>
<td>3.39</td>
</tr>
<tr>
<td>CE-Elaboration</td>
<td>0.81</td>
<td>2.88</td>
</tr>
<tr>
<td>CE-Memory</td>
<td>0.82</td>
<td>2.69</td>
</tr>
</tbody>
</table>

Table 3. Discriminant validity analysis for flat-screen TV

<table>
<thead>
<tr>
<th>Purchase Decision</th>
<th>Product Evaluation-TV</th>
<th>CE- Cognitive</th>
<th>CE- Analysis</th>
<th>CE- Elaboration</th>
<th>CE- Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.69</td>
<td>0.04</td>
<td>-0.03</td>
<td>-0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>ProductEvaluation-TV</td>
<td>0.71**</td>
<td>(0.91)</td>
<td>0.08</td>
<td>0.06</td>
<td>0.07</td>
</tr>
<tr>
<td>CE-Cognitive</td>
<td>0.05</td>
<td>0.12*</td>
<td>(0.79)</td>
<td>0.31</td>
<td>0.44</td>
</tr>
<tr>
<td>CE-Analysis</td>
<td>-0.03</td>
<td>0.08</td>
<td>0.52**</td>
<td>(0.69)</td>
<td>0.58</td>
</tr>
<tr>
<td>CE-Elaboration</td>
<td>-0.01</td>
<td>0.08</td>
<td>0.63**</td>
<td>0.74**</td>
<td>(0.81)</td>
</tr>
<tr>
<td>CE-Memory</td>
<td>0.03</td>
<td>0.14</td>
<td>0.71**</td>
<td>0.66**</td>
<td>0.81**</td>
</tr>
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</table>

Table 4. Discriminant validity analysis for backpack

<table>
<thead>
<tr>
<th>Purchase Decision</th>
<th>Product Evaluation- BP</th>
<th>CE- Cognitive</th>
<th>CE- Analysis</th>
<th>CE- Elaboration</th>
<th>CE- Memory</th>
</tr>
</thead>
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<tr>
<td></td>
<td>0.93</td>
<td>0.04</td>
<td>0.14</td>
<td>0.08</td>
<td>0.08</td>
</tr>
<tr>
<td>ProductEvaluation- BP</td>
<td>0.78**</td>
<td>(0.94)</td>
<td>0.05</td>
<td>0.14</td>
<td>0.12</td>
</tr>
<tr>
<td>CE-Cognitive</td>
<td>0.04</td>
<td>0.07</td>
<td>(0.81)</td>
<td>0.36</td>
<td>0.45</td>
</tr>
<tr>
<td>CE-Analysis</td>
<td>0.14**</td>
<td>0.18**</td>
<td>0.57**</td>
<td>(0.68)</td>
<td>0.51</td>
</tr>
<tr>
<td>CE-Elaboration</td>
<td>0.08</td>
<td>0.14**</td>
<td>0.66**</td>
<td>0.75**</td>
<td>(0.78)</td>
</tr>
<tr>
<td>CE-Memory</td>
<td>0.08</td>
<td>0.10*</td>
<td>0.72**</td>
<td>0.66**</td>
<td>0.74**</td>
</tr>
</tbody>
</table>

Table 5. Regression analysis for two scenarios: purchase intention is dependent variable

<table>
<thead>
<tr>
<th>Parameter</th>
<th>PurchaseIntention-Positive</th>
<th>PurchaseIntention-Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>t</td>
</tr>
<tr>
<td>Intercept</td>
<td>1.023</td>
<td>3.604</td>
</tr>
<tr>
<td>Product Evaluation</td>
<td>0.685</td>
<td>8.929</td>
</tr>
<tr>
<td>R</td>
<td>0.562</td>
<td></td>
</tr>
<tr>
<td>Rsq</td>
<td>0.315</td>
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</tr>
<tr>
<td>AdjRsq</td>
<td>0.312</td>
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</tr>
</tbody>
</table>
online consumer reviews and make their purchase decisions. Consumer knowledge plays a significant role in the relationship of online consumer reviews and purchase intention. Therefore, hypothesis 2 is partially supported. Further, we look at the moderating effect of product type. We ran regression analysis for flat-screen TV and backpack separately and found that for both products the product evaluation has significant impact on purchase intention (see Table 7, $\beta_{TV} = 0.839$, and $\beta_{backpack} = 0.822; p = 0.000$). In addition, the beta weight for product evaluation of flat-screen TV ($\beta_{TV} = 0.839$) is higher than that for product evaluation of backpack ($\beta_{backpack} = 0.822$). The results reveal that consumers involved in high involvement consumption decisions are more likely to seek out online consumer reviews when making or seeking support for their purchase decisions than those involved in low involvement consumption decisions. Therefore, the results provided support for H3.

### 4. Discussion and Implication

These results suggest that the valence (i.e. positive versus negative) of online consumer reviews exercise a significant impact on consumer purchase decisions. That is, the positive online consumer reviews will have a positive effect on the consumers’ purchase decisions and the negative consumer reviews will have a negative impact on the customers’ buying decisions. This finding partially clarifies the previous controversial studies, which show either positive impact or no impact of the message (i.e. positive vs. negative reviews) on the purchase decision and financial performance [7] [25]. In addition, this study extends previous studies and finds that the impact of negative online consumer reviews on purchase intention is stronger than that of positive online consumer reviews. In addition, we found that the consumer knowledge about a product or service impact their likelihood to use online consumer reviews to make purchase decisions. While other dimensions of consumer expertise such as cognition, analysis and memory were not found to have significant impact on the relationship between online consumer reviews and purchase intention in this study, we expect more studies to exam and clarify this issue.

The support for hypothesis 3 shows that high-involvement (that is, durable product) consumers are more likely to rely on online consumer reviews to make purchase decision than consumers of low-involvement products. This indicates that consumers are more inclined to use online consumer reviews to make purchase decisions for the durable products. Because durable products tend to entail larger-ticket purchases; they also tend to engender the perception, at least, of greater risks for potential buyers. By any measure, durable products are more likely than nondurables to be deemed important by consumers. Consequently, consumers apparently are much more willing to conduct greater information research and, in the process, physically examine the features and quality of the product. In turn, such consumers may be more likely to seek the online consumer reviews to make the buying decisions. On
the other hand, because non-durable products tend to be less expensive and to pose less risk to shoppers, it would appear that consumers are actually less willing to look for additional information source such as the online consumer reviews to make their buying decisions. An alternative explanation may lie in the less draconian consequences of loss resulted from purchasing low involvement products. The result implies that online consumer reviews could be a highly complementary information source for consumers of low involvement products. However, it is necessary to replicate this study in other settings or using different product categories in order to extend our findings in this study.

The results of this study yield several important theoretical and managerial implications. First of all, the findings indicate that, in the relationship between online consumer reviews and consumer purchase decisions, product type matters. The more durable a product, the more likely consumers are to look for online consumer reviews to make their purchase decisions. In addition, this study generates insightful managerial suggestions. Since online consumer reviews are growing in importance as an information source in the consumer purchasing decisions, especially for the durable products, marketers of durable (high involvement) products should pay more attention to the online communication channels to monitor the flow of the online consumer reviews. They should make strategic plans to stimulate and encourage more positive comments about their products and services through available online message channels. At the same time, managers may also need to take actions to minimize the negative information about their products and the company. For example, they may introduce new or improved products that better solve the consumers’ problems or provide better customer services to change consumers’ perception of the poor service quality. Since online reviews are, or, at least, ought to be an increasing concern for marketing management, the close monitoring of the online information channels could provide valuable insights on how to manage their product or service more effectively and efficiently. For instance, online consumer reviews can provide marketing firms important insights about key product features and quality aspects, e.g., the ones consumers presumably value the most or least, and on the consumers’ usage experiences and preferences, which could be considered and incorporated into the marketing plan.

Our study should yield three contributions. First, to our knowledge, this study is the first to empirically investigate the moderating influence of product type and consumer knowledge on the relationship between online consumer reviews and purchase decision. Second, we extend the existing consumer behavior literature by discovering the influential moderating effect of product type on the impact of online consumer reviews and purchase decision. Therefore, we enrich the current knowledge of online consumer information search and purchase decision behavior. Third, we enrich the WOM literature by investigating empirically how the new form of E-WOM—online consumer reviews—impact the consumer decision making and pre-purchase behavior.

The major limitation of this study is that is was based on a student sample. This may constraint the generalizability of this study, although, it should be noted, student and student-aged populations themselves are each key target segments for e-marketers. It may be worthwhile to replicate the study by using non-student samples within different age groups and diverse knowledge backgrounds. Future research is needed to conduct the study in other cultural settings, such as in China, Canada, Japan, India and Mexico, to investigate whether and how differences between Western and Eastern cultures or between developed countries and developing countries may impact consumers’ online information search behavior and the purchase decision.

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Customer Adaptation of Mobile Service Innovations (MSI): A Quantitative Analysis among Customers of a Swiss Retail Store Chain

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Abstract

Based on recent findings from a Juniper report nearly 1.5 billion mobile users will receive SMS ads in 2008 [1]. While mobile advertising spending is expected to increase to $5 billion by 2011 [2], mobile marketing can be still considered in its infancy. While over the last years, there has been tremendous progress in the area of web-based services delivered on the Internet [3] [4] [5] [6], less attention has been paid to the customer acceptance of mobile service innovations. Based on a literature review the authors pursue the objective to analyze the requirements for customers to adopt different types of mobile service innovations: (i) payments to be made via SMS (Short Message Service), (ii) coupons delivered via MMS (Multimedia Messaging Service), and (iii) SMS notifications for goods to be picked up. The authors develop a theoretical model which describes a consumer’s intention of MSI adoption as a construct that is determined by three variables: perceived usefulness, perceived ease of use and perceived risk. The relationships in the model are moderated by several factors: age, gender, technology-readiness of the customer and newness of the technology. The authors then conducted a quantitative study among customers of a Swiss retail store chain (n = 1,092). A structural equation model was formulized and tested for the different MSIs. The paper presents results and discusses managerial implications as well as limitations and future research opportunities.

Keywords: Mobile services, innovation, retailing, short message service, SMS

References

An Inventory Model with Two Classes of Customers in On-line Rental Service: Consumer Model Approach

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Abstract
This short version of the paper offers a model and analysis of the rental process at a subscription-based business like Netflix. We analyze a priority scheduling scheme, currently in use, that gives priority to light renters over heavy renters and show that, in some situations, it may be more profitable for the firm to give priority to heavy renters which is opposite to the Netflix’s current practice. The conditions determining the optimal initial inventory are proved analytically. Extensions are briefly discussed.

Keywords: Rental business, Inventory, Consumer Model, Two classes of customers

1. Introduction
Online subscription-based rental services have recently gained prominence. The customer pays a fixed fee per period for the right to rent goods from the rental firm. This business model is popular in DVD rental industry (Netflix or Blockbuster) but is also in use in many other products such as handbags (http://www.bagborroworsteal.com) and books (www.books泳.com). In this paper, our model is mainly motivated by DVD rental-by-mail industry. Netflix, the largest online DVD rental, constantly gains the subscribers. The company's published subscriber count increased from one million in the fourth quarter of 2002 to around 7.5 million at the end of the fourth quarter of 2007 [1]. Netflix's growth has been fueled by the fast spread of DVD players in households; as of 2004, nearly two-thirds of U.S. homes had a DVD player. Online offerings, not brick-and-mortar stores, will spearhead the rental market by 2010, according to a new study. The report, by The Convergence Consulting Group Limited in Toronto, said 44% of movie rentals will originate from stores in 2010, compared to 71% in 2007. Online rental, including Netflix and Blockbuster Online, will generate 37% of revenue, up from 25% in 2007 [3]. The recent advertising blitz by Blockbuster for its own rental-by-mail service, and the spreading of this model to many other countries (for example, Glowria in France and Lovefilm in UK) suggest that the industry will continue to thrive in near future.

The rental contract limits the number of DVDs a customer may have at any point in time but allows the customer to keep a DVD as long she likes. As soon as a customer returns a DVD, the rental firm sends her the next DVD on her list. From the rental firm’s perspective, this leads to an interesting classification of customers. Customers who are heavy renters return and get a new DVD more times in a month than do the customers who are, comparatively speaking, light renters. Since the rental firm pays for the postage, and since all customers in a subscription class pay the same monthly fees, the rental firm may think of heavy renters as less profitable customers than the light renters. While there may be other benefits of having heavy renters as customers, this observation about profitability may be driving Netflix’s policy of reserving the right to delay the rental deliveries to heavy renters [5]. Such differentiation between customers is more visible to customers in situations where demand is high, such as, a new blockbuster release. After weathering much criticism at Web based customer forums for discriminating against certain customers without explicitly saying so, Netflix has finally added a statement describing the policy on its Web site.

We develop a model to consider if such a policy to delay heavy renters is indeed useful for the rental firm. We introduce two considerations not mentioned above. First, heavy use also means that the DVD is quickly back into circulation and can be used to satisfy next demand and second, such a delay policy creates disutility for heavy rental customers. In this paper, using rational expectation framework, customers see the backlog or the accumulated number of shortage of rental items as the indicators of service quality. Our results show that, contrary to current practice, the rental firm, in some situations, may find it beneficial to delay the light users rather than the heavy users.

This short version of the paper is limited to addressing the above issue but our model has been extended to several new features that are part of this setting. One example is the list of movie titles a customer is required to keep. The rental firm uses this list to decide the next title that must be sent to a customer every time she returns a title. As a result, with the release of a new title, the rental firm has advance information about the demand, based on the number of people
who have the new title on their list. Our model extension proposes ways to use this information and thus quantify its value.

The need to differentiate between customer classes based on operational policy is tied to the fact that the more common tool for differentiation, price, is not available due to subscription-based nature of the service. Our model explores the possibility of creating a price-based differentiation scheme.

Inventory models of rental firms are typically difficult to analyze due to the complexity introduced by the return process which is incorporated in our model. In addition, the model also captures a decreasing demand pattern (over time) as [4] shows from historical rental data. Also our paper incorporates more than one customer segment with different rental behaviors. No papers in the literature we are aware of has included all these factors in one model. A recent paper with some of these features is [2] but their model has stationary demand pattern and one class of customer and also the focus of the paper is different from ours. The following section presents our basic model and some initial results.

2. The Model

We model a rental firm with customers who pay monthly fee for unlimited rentals of DVD movies sent by postal service. When a customer wants to watch a movie, she includes it in her list. When the customer returns her currently occupied movie, the firm sends her the next movie on the list. We model the rental process of one newly released movie title. The firm acquires an initial inventory of $M$ copies of the movie. When a customer who has this title on the top of her list returns a movie to the firm, that return constitutes the rental demand for one unit. The firm may choose to delay satisfying this demand. It is possible that the firm sends this customer another movie on her list while keeping her waiting for her first choice in the list. If the firm delays the customer’s demand, it is considered backlogged because the movie title still remains first on the customer’s list. The backlog will clear when the firm has an available copy and sends it to the customer.

We assume that there are two segments of customers: light renters (denoted by subscript $l$) and heavy renters (denoted by subscript $h$). The light renters request a fewer number of movies per month than the heavy renters while both of them are charged the same monthly fee. We assume that the demand rate $\lambda_i(t)$ for segment $i$ when $i = 1$ and $2$ are known and decreasing in time and then $\lambda_i(t) < 0$. At any point in time, the number of copies of the movie occupied by segment $i$ customers is $k_i(t)$. A proportion $p_i$ of segment $i$ customers occupying the movie return the movie to the firm. Then the return rate of segment $i$ customers is $p_i k_i(t)$. We assume that the light renters segment has a lower value for this proportion $p_l$ than the heavy renters segment has for its proportion $p_h$; that is, $p_l < p_h$. This assumption helps us to differentiate between the segments based on their return behavior. For example, if both segments occupy the same number of copies, we would expect the number of returns per time-unit to be greater for the heavy renters segment because of the fact that the customers in this segment keep their movies for shorter periods.

We model a priority policy at the rental firm. The customers fall into two classes: class 1 with high priority and class 2 with low priority. This allows us the flexibility to assign high priority to either light renters segment or heavy renters segment. In the basic model presented here, we assume that the company will satisfy both classes of demand but when the demand exceeds the available copies, class 1 demand will have priority over class 2 demand. It is further assumed that the initial inventory $M$ is large enough to satisfy all class 1 demands at all times; however to make the problem non-trivial we also assume that the total demand is larger than number of copies available at the start or there is shortage of copies of DVD. This is a reasonable assumption because shortage of DVD copies is observed in practice initially and also the demand of DVD peaks at the beginning and starts to decrease over time [4]. Therefore, it is more realistic to investigate the case with initial shortage. However, this assumption is relaxed in extensions to this short paper.

The number of copies occupied by class 1 customers is governed by:

$$k_1(t + \Delta t) = (\lambda_1(t) - p_l k_1(t))\Delta t + k_1(t)$$

Let $\Delta t$ go to zero and we get:

$$\frac{dk_1}{dt} = \lambda_1(t) - p_l k_1(t)$$
Solving differential equations, the number of copies occupied by class 1 customers, is:

\[ k_1(t) = e^{p_1 t} \left[ \int_0^t \lambda_1(x)e^{p_1 x} \, dx + K_1 \right] \]

where \( K_1 \) is the initial copies class 1 customers occupy at time 0.

During the time when there is not enough copies to satisfy both demands, \( k_1(t) = M - k_1(t) \) and the return rate is then determined by \( p_1k_1(t) + p_2k_2(t) = p_1k_1(t) + p_2(M - k_1(t)) \). Because the demand rates are decreasing over time, at some \( t_i \), the return rate is enough to satisfy both demand rates for the first time. We find \( t_i \) by using the following identity:

\[ p_1k_1(t_i) + p_2(M - k_1(t_i)) = \lambda_1(t_i) + \lambda_2(t_i) \]  

(1)

Note that \( t_i \) is a function of \( M \). The total number of units backlogged is:

\[ B(M) = \int_0^{t_i(M)} \lambda_1(t) + \lambda_2(t) - \left( p_1k_1(t) + p_2(M - k_1(t)) \right) \, dt \]  

or, equivalently,

\[ B(M) = \int_0^{t_i(M)} \lambda_1(t) + \lambda_2(t) - p_2M + \left( p_2 - p_1 \right) k_1(t) \, dt \]  

(2)

In this paper, only the sketches of the proofs are given or the proofs are omitted but all the results are proved analytically. By using (1) and the fact that \( t_i \) is the first time the backlog goes to zero we can show the result in Lemma 1.

**LEMMA 1.**  
\[ \frac{dt_i}{dM} = \frac{p_2}{\frac{d}{dt} \left[ \lambda_1(t) + \lambda_2(t) - \left( p_1k_1(t) + p_2(M - k_1(t)) \right) \right]_{t=t_i}} < 0 \]

This means as \( M \) increases, the duration over which backlog accumulates decreases. Using (2) and Lemma 1, we arrive at Lemma 2.

**LEMMA 2.**  
\[ \frac{dB(M)}{dM} = -1 - p_2t_i(M) < 0 \]  

and \[ \frac{d^2B}{dM^2} = -p_2 \frac{dt_i(M)}{dM} > 0 \]

Lemma 2 states that as \( M \) increases the total backlog decreases and that \( B(M) \) is strictly convex in \( M \).

We are now ready to develop a profit function for the rental firm. First, let \( N_i \) denote the total number of class i demand. We do not present a detailed customer utility model here but, briefly, in a rational expectation framework, the backlog \( B \) is seen as an indicator of quality of service by class 2 customers and influences their decision to join the subscription service. The consumer model leads to \( \frac{dN_2(B)}{dB} < 0 \) and \( \frac{d^2N_2(B)}{dB^2} > 0 \) is not a function of \( M \).

The firm acquires each copy of the movie at a cost of \( c \) dollars. By having a copy of movie available for a class i customer, the rental transaction generates the net profit \( f_i \) which is computed by dividing (monthly fees – expected postage cost) by expected value of number of rentals per month. It is obvious that the profit from a light renter, \( f_i \), is greater than the profit from a heavy renter, \( f_h \) because both have the same monthly fees but heavy renters have higher number of rentals in a month. The profit function for this particular movie title is determined as:

\[ \pi(M) = \sum_{i=1}^{2} N_i(M) f_i - cM \]
Apply first order condition for maximum point and Lemma 2, we yield:

\[
\frac{d\pi(M)}{dM} = f_2 \frac{dN_2(M)}{dM} - c = f_2 \frac{dN_2}{dB} \frac{dB}{dM} - c = 0
\]

That is, the optimal \( M \) is chosen in such a way that the backlog stop at \( t_1^* \).

**LEMMA 3.** The profit function is maximized at:

\[
t_1^* = \frac{1}{p_2} \left( \frac{c}{(f_2 - c_p) \frac{dN_2}{dB}} - 1 \right)
\]

Next we use Lemma 3 to find optimal initial inventory \( M \). Because (1) holds for any value of \( M \), \( M^* \) satisfies identity (1):

\[
\lambda_i(t_i^*) + \lambda_2(t_i^*) - \left( p_i k_i(t_i^*) + p_2 k_2(t_1^*) \right) = 0
\]

\[
\lambda_i(t_i^*) + \lambda_2(t_i^*) - p_i k_i(t_i^*) - p_2 \left( M - k_i(t_i^*) \right) = 0
\]

This yields,

\[
M^* = \frac{1}{p_2} \left[ \lambda_i(t_i^*) + \lambda_2(t_i^*) + (p_2 - p_i) k_i(t_i^*) \right]
\]

Also, apply the second condition, we get.

\[
\frac{d^2\pi(M)}{dM^2} = f_2 \frac{d^2N_2(M)}{dM^2} = f_2 \frac{dN_2}{dB} \frac{d^2B}{dM^2}
\]

Using Lemma 2, \( \frac{d^2\pi(M)}{dM^2} > 0 \)

\( \pi(M) \) is a concave function of \( M \) and the optimal \( M^* \) is unique.

By using Lemma 2, Lemma 3 and the results above, we can conclude:

**PROPOSITION 4.** The profit function is strictly concave in \( M \) and the optimal initial inventory \( M^* \) is uniquely determined by:

\[
M^* = \frac{1}{p_2} \left[ \lambda_i(t_i^*) + \lambda_2(t_i^*) + (p_2 - p_i) k_i(t_i^*) \right] \quad \text{and} \quad t_1^* = \frac{1}{p_2} \left( \frac{c}{(f_2 - c_p) \frac{dN_2}{dB}} - 1 \right)
\]

Because of strict concavity of profit function, the optimal \( M^* \) could be easily searched using any line search algorithm such as Newton’s search. Let \( \overline{N}_i \) is the maximum number of class \( i \) customers with zero backlog where \( i \in \{ l, h \} \).

Using the optimal \( M^* \), we compare the profit functions using the policies giving priority to heavy and light users and arrive at the result in Proposition 5.

**PROPOSITION 5.** Under the following condition, setting the heavy renters as class 1 yields better result than the
The left hand side of the condition is the maximum profit loss when setting the light renter as class 2 while the right hand side of the condition is the optimal profit loss when setting the heavy renter as class 2. When this condition holds, giving priority to heavy renters results in higher profit which is opposite of the current practice at Netflix. This is very interesting result because even with this stylized model, we prove that the policy used currently at Netflix is not always optimal and the further investigation is needed to find an optimal policy. When the heavy renter is sensitive to the backlog or when the total number of heavy renters is very large, the condition is more likely to hold. In such cases, even after the backorder-sensitive customers leave, the net number is still large compared to the light renters.

3. Conclusion and Extensions

We have built a model for rental firms that, unlike much of the existing literature, explicitly captures the return process and more than one customer class. The model offers insights into current scheduling practice at Netflix and offers an alternative. In extensions to this work, we explore the optimal scheduling policy and determine the value of the demand signal contained in customer’s waiting lists. We are also working on comparing a price-based scheme to discriminate between the segments with the current scheduling-based scheme.

References

Usability and Accessibility in E-commerce Web Sites

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Abstract
This paper argues that the accessibility and usability of an e-commerce web site are the primary determinants of customer experience. They are also top factors for improving conversion rate and hence the return on investment. Accessibility of web sites to people with disabilities is a legal requirement in many countries. Section 805 in the US and the Disability Discrimination Act in the UK both require providers to make their web sites accessible to people with disabilities. Organizations are now realizing the social and financial benefits of making web sites accessible to people who are older or who have disabilities. The paper reviews usability and accessibility international Standards, guidelines and practice and the current state of e-commerce usability and accessibility. Case studies of e-commerce web sites accessibility and usability and an approach to their evaluation are presented. These include a major telecommunication company, a travel agency and a bank. These case studies describe examples of current practice in the United Arab Emirates; a country with a rapidly growing economy and the highest rate of Internet use in the Middle East [3]. Despite the wealth of information and guidelines available on accessibility, the web site tested neglected some basic accessibility features.

Keywords: Usability, accessibility, e-commerce sites, evaluation case studies

1. Introduction
The usability of an e-business platform can have an appreciable impact on the ability of customers to achieve their goals and do business. The benefits of usability extend beyond improving the user interface and end user productivity. Its beneficiaries include developers and their companies [36]. Good usability leads to customer satisfaction, higher conversion rates and returning customers [26] [36]. Conversely, bad usability leads to angry customers and loss of business. Good usability also contributes to reduced maintenance costs as most of these relate to unmet or unforeseen user requirements or usability problems [24].

There are many example cases illustrating the benefits of good usability. One of the most impressive is a redesign of the IBM web site undertaken to improve usability and navigation which led to a 400% increase in sales and an 84% decrease in the use of the help button in the first week after the redesign [36]. Creative Good, a leading consultancy on customer experience design, have reported 40% to 150% improvements in key metrics over a six year period as a result of applying their "Joining usability with strategy" methodology [4]. These metrics include revenue, cost savings, conversion rate, customer acquisition rate and retention costs.

ISO 9241-11 defines usability as the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use. A definition of usability, relevant to web services, according to Reddish [25] is that users can:

- Find what they need
- Understand what they find
- Act appropriately on that understanding
- Do all of that in the time and effort that they think the task is worth

Designing for accessibility has moral and ethical underpinnings. These relate to the principles of equity in use and removing barriers to exclusion. Accessibility of software to people with disabilities and special needs is also a legal requirement in many countries. In addition, there are sound business reasons for organizations to make their web sites accessible. With accessible web sites, companies can reach more customers; increase their market share and ultimately their revenues and profits. By using appropriate assistive technologies, accessible sites represent an unprecedented opportunity to reach customers who find it difficult to overcome barriers to access that are present in traditional media such as print and TV, for those with visual impairment, and radio for those with hearing impairment. Accessibility also benefits users who are older, have a temporary disability, have low literacy or language fluency, or with low bandwidth connections.
2. Usability and Accessibility International Standards, Legislation and Practice

2.1 Web usability guidelines and Standards

The most well established usability Standard is ISO 9241, Ergonomics of Human-System Interaction [12]. This contains 17 parts including guidelines for the software aspects of the user interface - menus, forms, information presentation, etc. Part 11, Usability, provides usability metrics based on the operational definition that can be employed in user evaluations. Following the completion of the Standard, work is underway on a major revision and restructuring to incorporate other relevant Standards and make the ISO 9241 series more usable.

A new Standard for web usability, ISO 23973 [15] has been under development (supplementing the ISO 16071 Standard on general software accessibility [14]). The new Standard relates to the design and commissioning of web sites and is particularly valuable for those involved in making design decisions and need some authoritative guidance. This Standard will become Part 151 of the revised ISO 9241 and will be entitled: ‘Software ergonomics for World Wide Web user interfaces’ [32]. The Standard contains detailed guidance in four main areas: purpose and strategy, content and functionality, navigation and interaction, and presentation and media design.

2.2 The current state of e-commerce web usability and its evolution over the last 10 years

The acceptance of e-commerce, enabling ordinary people and business to conduct transactions online has been growing steadily since around the year 2000. Initial resistance to widespread uptake at the start of the millennium was due to a number of factors; the slowness of Internet connections in people’s homes, lack of trust in online transactions, and poor usability of Internet sites. Jared Spool, for instance, conducted a user study where it was found that users visiting the best sites (some e-commerce) could only accomplish their goals 42% of the time. 58% percent of the time they failed [31]. Web design became a key area within the HCI and Human Factors community and the growth of usability consultancy services started to address these problems. To some extent they have succeeded with many companies such as airlines and supermarkets successfully transferring a high proportion of their business online. Yet e-commerce services are far from uniformly usable today. Travis, [35] in his book on e-commerce usability commented in 2002 that “independent reports are issued on a regular basis that highlight how much business is lost by websites that are difficult to use…. People who want to buy products are unable to because of navigation difficulties; customers are unable to find the correct page to choose the product, or are unable to find the payment option”. For a recent example, see Webcredible [40].

Despite the importance of usability, there are no specific legislative requirements requiring that websites must be usable. It is in general the fear of poor publicity, loss of confidence in the site by the consumer and the danger of them not returning, that encourages organizations to produce more usable websites.

2.3 Accessibility guidelines and Standards

There are several accessibility guidelines and Standards including:
ISO 9241-171: Ergonomics of human-system interaction – Guidance on software accessibility: a comprehensive and technical Standard, drawn up by independent international Standards experts, with 150 individual statements, classified as either 'Required' or 'Recommended' [13].
IBM software accessibility checklist: IBM has taken a very proactive attitude to accessibility for a long time, and their checklist is one of the best tools on the Net [11].
Irish IT Accessibility Guidelines: The National Disability Authority (NDA) is an independent agency under the Department of Justice, Equality and Law Reform in Ireland. The NDA commissioned guidelines to provide direction on making electronically delivered services accessible to people with disabilities. The guidelines for application software have seventeen statements and two levels of priority. The website also contains some helpful information about a general process by which accessible IT can be developed successfully [18].
Tiresias checklist for software applications: The Tiresias website contains lists of guidelines for the design of many types of ICT systems, including software. A checklist of around 75 statements is available, which also identifies which disability types are likely to be impacted by each statement [34]. The World Wide Web Consortium (W3C) develops interoperable technologies (specifications, guidelines, software, and tools) to lead the Web to its full potential. W3C is a forum for information, commerce, communication, and
collective understanding. The W3C’s WAI (Web Accessibility Initiative) established guidelines for web sites to achieve, based upon 3 levels or priorities of achievement [39].

2.4 Accessibility legislation in US, UK and elsewhere

Section 508 - amended in 1998 [30] - is the United States legislation that requires Federal agencies to make their electronic and information technology accessible to people with disabilities. The law applies to all Federal agencies when they develop, procure, maintain, or use electronic and information technology. The section about software applications and operating systems contained twelve key statements. Most of these related to usability for people with sight impairments. Other types of disability are addressed less well.

The UK Disability Discrimination Act 1995 (the DDA) [5], was introduced with the intention of comprehensively tackling the discrimination which many disabled people face. The DDA makes it unlawful to discriminate against disabled people in terms of recruitment and employment, provision of services, or education. Software (including web sites) is covered under the employment and the education provisions, as there will be IT systems that employees, staff and students need to use to carry out their jobs (RNIB [28]). Software will also be covered when it forms part of the provision of a service, such as in a system that needs to generate letters in appropriate formats.

The public sector Disability Equality Duty also expects consideration of accessibility in the procurement of software. The following paragraph is taken from the Statutory Code of Practice for England and Wales, on the duty to promote disability equality (section 3.46). A similar example is quoted in the Code of Practice for Scotland. "A Government department that is planning to procure a new IT system should ensure that its action plan includes the work it will do to ensure that the new system is suitable for use by disabled employees. The action plan should also indicate the way it will develop the specification so that the system delivers the right products for disabled customers”.

2.5 The current state of e-commerce web accessibility and its evolution over the last 10 years

If an ecommerce website is to be successful in increasing sales and customer loyalty it must be carefully designed. Giving careful consideration to issues relating to website design and accessibility is essential if an ecommerce website is to be inclusive of people with disabilities. In 2004, the Disability Rights Commission issued a report into the accessibility of websites [6]. The report summarizes the status of web accessibility based on a series of surveys conducted by different organizations:

The Royal National Institute of the Blind (RNIB) published a report in August 2000 on 17 websites, in which it concluded that the performance of high street stores and banks was “extremely disappointing” [27]. A separate report in September 2002 from the University of Bath described the level of compliance by United Kingdom universities with website industry guidance as “disappointing”; and in November 2002, a report into 20 key “flagship” government websites found that 75% were “in need of immediate attention in one area or another” [10]. Recent audits of the UK’s most popular airline and newspaper websites conducted by AbilityNet reported that none reached Priority 1 level conformance and only one had responded positively to a request to make a public commitment to accessibility [1].

The report made recommendations that:

1. Disabled people need better advice about the assistive technology available;
2. A business case should be established to ensure that higher quality assistive technology products are available at lower cost;
3. Vendors of operating systems and browsers should help disabled users identify, select and employ the accessibility features in those products;
4. Website developers are relatively well informed about the existence of accessibility guidelines, but require training in the use of accessibility features in the development environment they are using;
5. Website owners and commissioners must better understand the accessibility needs of disabled people, and recognize that it is in their commercial interest to meet the needs of these users;
6. Automated testing of websites is an important resource for website developers and owners that should be used more widely along with human evaluations.
3. Evaluating Usability and Accessibility

Different methods can be used in evaluating the usability and accessibility of e-commerce sites. What follows is a discussion of the ones which are most commonly used.

3.1 Usability

3.1.1 Heuristic evaluation

Heuristic evaluation is a method for finding usability problems in a user interface. A small set of evaluators undertake a systematic inspection of the interface and judge its compliance with recognized usability principles (heuristics). Heuristic evaluation falls into the general category of usability inspection methods [19] [21]. Some of the most widely used heuristics are those developed by Nielsen [22]. Heuristic evaluation is considered as a discount usability engineering method. The focus is on achieving "the good" with respect to having usability engineering work performed even though the methods may not be the absolute "best" methods. He recommends an evaluation method based on user and task observation, scenarios as prototypes of the system, and heuristic evaluation [20]. A review of problem types found using Heuristic evaluation is available from Nielsen [23].

Heuristic evaluation is an effective and a cost efficient method that is particularly valuable in circumstances where cost and schedule are constrained. Despite its simplicity and cost effectiveness, the reliability of heuristic evaluation as a usability evaluation method has been questioned. One problem is that it is based on the opinions (the expert judgment) of the evaluators. When designers are given the results of the heuristic evaluation and requested to make changes to their design, they may seek to question the validity of the findings. Although the heuristics are based on established design principles, different sets of heuristics can be used in evaluations leading to different findings. For example, Rosenfeld [29] has developed heuristics that are specifically aimed at information architecture. Another common criticism of HE's is that they are capable of generating a large number of relatively minor usability problems that are likely to go unobserved in an empirical usability study, but are identified by evaluators whose awareness is heightened by the guidelines.

3.1.2 Usability testing

The goal of usability testing is to determine whether the product being developed is usable by the intended user population to achieve the tasks for which it was designed [7]. As with heuristic evaluation, user testing aims to find design problems, but from the basis of users attempting to use the system. Some key issues in usability testing are the identification of a representative user sample and development of scenarios and tasks to be used in the tests. The tasks must be realistic, doable with the application and explore the system thoroughly. Tasks of varying degree of complexity are typically used in the tests.

Different types of data can be collected in usability tests. Data concerning task completion rates, number of errors made, and the time it takes to complete a task forms quantitative performance measures. User satisfaction data can also be gathered by using questionnaires and interviews. Observation data can be collected by having an observer watching the users or by recording the session and watching it back.

It is generally accepted that between 10 – 15 users are needed in a usability test. However it is possible to use a smaller number when the budget and the schedule are constrained or when the process is iterative. In a series of experiments, Virzi [37] found that about 80% of the usability problems were uncovered by 5 test subjects.

3.2 Accessibility

Methods similar to the ones discussed above can also be used to evaluate accessibility. This requires experts in accessibility issues or representative users with disabilities. An inspection method using accessibility guidelines (e.g. Web Content Accessibility Guidelines WCAG [38]) or checking for country specific recommendations such as the USA’s Section 508 requirements can be employed [30]. In addition, the application can be tested with users who are disabled or who have special needs. Issues of concern when evaluating accessibility include the use of alternative text for images, sufficient color contrast, variable text size and page width and alternatives to any scripts or image maps. Also important is compatibility with AT (assistive technology) such as screen readers and speech
input devices. Another key aspect is access to the website via different browsers on different platforms. Ensuring compatibility can be a time consuming task.

### 3.3 Proposed framework

Several studies have suggested that it is not adequate to use a single method in order to achieve comprehensive usability evaluation [2] [17]. They recommend that both user testing and heuristic inspection should be used as evaluation tools and as methods for guiding design improvements. Another factor is that heuristic evaluation does not produce data of the same precision and reliability as usability testing. Most practitioners therefore advocate using heuristic evaluation as a supplement to usability testing. This is similar to the use of multiple data gathering or data analysis techniques. This can provide different perspectives and corroboration of findings across techniques thus leading to more defensible findings.

The approach to evaluating e-commerce web site usability and accessibility presented in this work combines heuristic evaluation and user testing where participants are asked to work through a set of tasks that are representative of what customers perform on the website. A set of 10 – 15 tasks is developed for each e-commerce web site. Participants were asked to complete the tasks using the think aloud protocol. Interaction data was recorded using the Morae [33] usability evaluation software which enabled a video log of the interaction to be generated. It also supported qualitative analysis through observation and quantitative analysis through performance charts and histograms. Evaluating accessibility involved a preliminary review of a representative page sample from the web site, the use of graphical and specialized browsers and the use of an automated web accessibility evaluation tool [8].

### 4. Case Studies Illustrating Usability and Accessibility Practice in the UAE

#### 4.1 Telecommunication

Etisalat is a major telecommunications provider in the UAE. It provides a variety of services for mobile and fixed line telephony, Internet and TV. The usability and accessibility of the web site (See Figure. 1) were evaluated according to the methods described above. The heuristic evaluation used the ten heuristics developed by Nielsen [22] and adapted for the web by Instone [9]. Both positive and negative findings for each of the categories were noted. Table 1 summarizes some of findings. Some findings relate to more than one heuristic as shown. The main issues found relate to improving the navigation to service information pages and achieving this through an information architecture that provides consistency of presentation.

Usability tests were carried out on the Etisalat web site utilizing a setup with 3 computers running the Morae usability evaluation software. These are recorder, observer and manager. The recorder software is used on the participant's workstation and provides a sophisticated video recording of the test. The observer software enables an evaluator to see the test in real time and place markers to indicate the start and end of each task and to indicate significant events or observations (for example points where the user gets stuck or requests help). The evaluator can also add comment and observation to the video. The manager software facilitates the subsequent analysis of the data and generates summary statistics and charts. It also enables maintenance of the data created by 'observer'. Test participants were asked to 'think aloud' during the tests. Participants completed 13 tasks selected to reflect the range of services provided by Etisalat. A total of five participants completed the tests.

A wealth of performance data is generated from the recordings including the average time to complete a task, the number of mouse clicks per task, task difficulty score and the time spent on the homepage, navigation pages and destination pages per task. As shown in Figure 2, participants were most successful with tasks 2, 4, 7, 9 and 13 and least successful with task 5 (the lower the score the easier the task and the more successful participants were).

Bringing together the information about the times spent on the different types of pages into one chart enables the display of the average time spent on each type of page for each task. This is shown in Figure 3 and is an informative summary of the navigational aspect of task performance. Given the findings of the heuristic evaluation regarding navigation and information architecture, the chart shows clearly which tasks required a great deal of time spent on navigation. With task 5, we find that the time spent on the destination page is 0 indicating that users were unable to find the information.
Figure 1. The home page of Etisalat.

Table 1. Findings from the heuristic evaluation – a selective summary list

<table>
<thead>
<tr>
<th>Heuristics</th>
<th>Positive Findings</th>
<th>Negative Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1 Visibility</td>
<td>Navigation bar that shows the path from the home page to the current page through routing pages and provides opportunity to backtrack</td>
<td>Banners and headline links can mislead users who click on them in the belief that they will lead to service information pages</td>
</tr>
<tr>
<td>H5 Error Prevention</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H3 User control and freedom</td>
<td>The drop down lists provide fast access to service information – suitable for experienced users.</td>
<td>Too many service options are available from the drop down lists in the upper right corner of the page.</td>
</tr>
<tr>
<td>H2 Match with Real World</td>
<td>The site uses English and Arabic the 2 main languages spoken in the UAE</td>
<td>Users have to remember or understand the names of certain services (e.g. Tarjim - the translation service)</td>
</tr>
<tr>
<td>H6 Recognition rather than recall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H4 Consistency and Standards</td>
<td>The same fonts, colors and look and feel are used throughout the pages</td>
<td>Too many and different categorizations are provided to access the services</td>
</tr>
<tr>
<td>H5 Error prevention</td>
<td>User input is generally by selections instead of free text</td>
<td>Unhelpful search facility message when no results are found</td>
</tr>
<tr>
<td>H8 Aesthetic and minimalist design</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 2. Average task success scores

Figure 3. Average time per task by webpage types
An evaluation of the Etisalat web site for accessibility revealed several issues. The site had clickable images without alternative text as well as form controls without labels. These 2 problems make the site non compliant with Section 508 requirements [30] and the WCAG [38]. Also in some places, low contrast text was used and other minor issues were noted.

Overall and despite the problems noted above, the site had a good design for usability. An improved and redesigned site will deal with the usability and accessibility issues that the evaluation has uncovered.

4.2 Travel and tourism

Salem Travel Agency is one of the main travel agencies in Abu Dhabi, UAE and provides holidays and travel services. The web site provides information about the services offered, holiday packages, promotions and flight bookings. An evaluation of the usability and accessibility of the web site has been carried out. Both a heuristic evaluation and user tests have been undertaken in a manner similar to that described for the Etisalat case study.

It was found that the site had an attractive, visually appealing design and color scheme. However, the multiplicity of usability and accessibility problems calls for a redesign of the web site; in particular its functionality and information architecture. The heuristic evaluation uncovered both major and minor problems. For example, the online booking facility for flights, cars and hotels was not functional; in many places navigation was counter-intuitive or outright confusing (a number of options appear when 'flight booking' is selected – travel guides, weather, currency converter – this is not what would be expected from flight booking; when one of these latter options are selected they lead to a non-functional booking screen). There was no support for a local language version of the site. The site also had outdated content, dead links and missing images. This can cause the user to distrust the information provided. There is also a lack of consistency in the application of the color scheme, in opening new windows when certain selections are made, and in the use of drop down and pull down menus. User testing confirmed the navigation problems reported with users having difficulty completing tasks such as 'check Singapore's weather for the next 5 days' and 'find the conversion rate between the UAE Dirham and the Singapore Dollar'.

Similar to the telecommunication's company's web site, the site had images without alternative text as well as form controls without labels. These problems make the web site non compliant with Section 508 requirements [30] and the WCAG [38].

4.3 E-banking

As part of an ongoing study into e-banking in the UAE, an evaluation framework specifically aimed at e-banking services has been developed. This combines usability and accessibility with functionality, security and customer service. Initially, questionnaires and heuristic evaluation have been used as the evaluation methods. These will set the stage for subsequent user testing. The e-banking services of 4 regional banks have been selected for this study. In the completed questionnaires, customers expressed commitment to e-banking, and the majority of respondents trusted the security of their e-banking service. Several respondents, however, expressed frustration with their e-banking service citing login problems and ineffective offline support. A heuristic evaluation of the e-banking service identified from the questionnaires confirmed these problems with the evaluator being asked to repeatedly and endlessly change the login password during the evaluation session. The lesson to be learnt here is that security initiatives and improvements should not compromise the usability of the service.

5. Discussion

The findings from the evaluation case studies show that whilst companies in the UAE have managed to develop visually attractive designs for their e-commerce sites, usability and accessibility problems of varying degrees of severity exist. The most important finding concerns accessibility as all of the web sites tested had problems relating to accessibility. For example the web sites tested did not include alternative descriptive text for images or explicit labels for form controls. People who are using screen readers will not be able to make sense of the image content. These issues make the sites non-compliant with the most basic of levels of the WCAG [38]. This is surprising given the wealth of freely available information on accessibility which companies and web design agencies can refer to. It is worth noting that UAE has not yet legislated on accessibility for information spaces. There were, however, many positive findings and examples of good practice relating to usability. These included the feedback given to the user of the web site, the use of familiar jargon free language, the use of consistent style and presentation and good error
prevention. The most important negative findings related to the information architecture and navigation support i.e. the navigation from the home page to destination pages through linking pages. It was possible to combine the qualitative findings from the heuristic evaluation with the quantitative analysis that shows, for each task, the time spent by participants on the different types of web page (classified as home, navigation, and destination pages). This has lent support to the overall conclusions reached.

For companies developing e-commerce platforms, what are the practical steps that can be undertaken to ensure an accessible and a usable system? The following steps are recommended:

- Include users with special needs and accessibility experts in requirements analysis and testing
- Develop accessibility and usability awareness amongst the development team
- Employ design agencies who demonstrate experience in accessibility and usability
- Employ a user centered design process which is driven by user needs
- Take account of established guidelines and include evaluation against guidelines

6. Conclusion

It is concluded that the usability and accessibility of interactive systems are well represented in international guidelines and Standards. Web usability is currently the subject of a new international Standard (ISO 23973) [15]. As noted above, accessibility is also a legal requirement in many countries. An evaluation framework using a combination of methods for usability and accessibility evaluation has been advocated and applied to e-commerce web sites in the UAE.

Given the findings of the evaluation case studies with respect to accessibility, possible reasons for ignoring accessibility requirements include lack of awareness of accessibility issues, lack of commitment on the part of developers and their companies, and the absence of local legislation. A program to raise awareness of accessibility and an appreciation of the business case for accessible web sites is likely to improve the situation. This is likely to be enhanced further by the passing of local legislation in the UAE. In the future, usability and accessibility will be seen as equally important which will be to the benefit of all users.

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Designing Privacy and Security Protection in RFID-enabled Supply Chain

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Abstract

RFID is an automatic identification system that uses radio frequency technology in product tags. The technology brings out the greater enhancement to synchronize the logistics flow and information flow. Unfortunately, it also introduces the great concerns on the privacy and security protection, not only on the individual use but also on the supply chain collaboration. This study proposes an on demand access control to protect the information flow in an RFID-enabled supply chain. The design considers the role in a supply chain as well as the media of carrying the information. A case study on garment industry will be provided for validation.

Keywords: RFID, EPC, Privacy and Security, Access Control, Supply Chain

1. Introduction

Radio Frequency Identification (RFID) can be applied to many areas, such as inventory management, theft prevention, asset tracking (people, animals, tools, and vehicles), express checkouts (highway and tunnel payment or luggage checking), location-based information (travel guides or horse racing), and others. The advantages of RFID tags are that, unlike printed barcodes, they do not need a direct “line of sight,” and multiple tags can be identified in a short time (from tens to hundreds per second). Moreover, the tags are resistant to dirt, have a large amount of unique identifiers, and can be read (and written) by readers without being visible. However, the disadvantages are that the signals that are transmitted from the tags can be read by other equipment within range, and interference can occur when more than one reader is transmitting or more than one tag is responding. Possible consumer privacy issues are also a concern.

However, the growth in the use of RFID which enables the unique identification of objects and invisible tracking, has given rise to increased concern about the invasion of privacy [1] [2] [3]. To end consumers, as a result, two notable privacy threats are leaking information pertaining to personal property, and tracking the consumer’s spending history and patterns and physical whereabouts [4] [5]. Therefore, how can the adoption of RFID technology to improve supply chain management be balanced with the privacy protection. The provision of guidelines (will discuss in next section) such as those that were published by the Ontario Privacy Commissioner [6] and the Japanese Ministry of Public Management, Home Affairs, Post and Telecommunications [7] to protect privacy is a possible, but passive, solution.

The aforementioned guidelines work as instructions about the extent to which privacy should be protected. However, security tools are needed to achieve true data protection. A privacy coin shows the relationship between privacy protection, security boundaries, and security requirements. The security tools should achieve protection from improper access, protection from interference, the integrity of the data, the operational integrity of the data, the semantic integrity of the data, accountability and auditing, user authentication, the management and protection of sensitive data, multi-level protection, and confinement to avoid undesired information transfer between system programs [8]. These tools ensure that the information does not either explicitly (through placing queries) or implicitly (through inference from related data) flow over the boundary and invade privacy. The other side of the coin indicates that privacy protection cannot be achieved only by security measures, but must also feature authentication and non-repudiation, which ensure that data are correctly provided and received.

This study explores the privacy and security issues manifested by RFID adoption in the supply chain. There are many new challenges and our intention is to address the potential privacy and security concerns raised and propose a scheme to articulate the preference in the sharing of RFID-based data; such scheme is the basis for the design and development of new technology – on-demand access control. The access control is a common term used in database security that mainly differentiated in discretionary security mechanisms and mandatory security mechanisms [9]. The discretionary control specifies the access privileges of users explicitly while mandatory security mechanisms identify the security levels of both subjects and objects. However, neither model provides
mechanism to prevent the information from flowing from authorized to unauthorized users [10]. To support the flow control model such as the lattice model [11] and the RBAC model can be adopted. In the lattice, the flow relationships are organized into classes and the data flowed from one class to another class are constrained explicitly or implicitly. Role-based access control (RBAC), on the other hand, applies permission policy based solely on the role of a user at the time of accessing a data source [12] [13]. A role is a function involved in executing a job with certain authority and responsibilities and thus is suitable for workflow management [14][15]. Roles are pre-determined for a data source.

For RFID-based data and information sharing between supply chain partners access policy is applied base on their relationship of which the role of the requesting side is only one of many attributes. The access policy is further determined by other relationship attributes such as long-term vs. one-time, dominant vs. causal as well as the parties’ dual willingness to share. The relationship needs to be determined at the time of sharing as it changes over time even when data requestor’s role remains unchanged. Hence, the one-party, pre-determined, role-based access control is not applicable to two-party, derived on demand, “relationship-based” access control requirement for sharing RFID-based data. We validate the model using a garment supply chain. An interview to three RFID users was also conducted to verify the model.

2. RFID Tags and Privacy Protection
In late 1999, a research group, the Auto-ID Center, was setup at the Massachusetts Institute of Technology with sponsors in both the technology sectors and industrial giants, such as Wal-Mart and P&G. The Center proposed a uniquely identifiable Electronic Product Code (EPC) stored in a medium that follows the new Radio Frequency Identification (RFID) standards. These technologies were then transferred to and commercialized by the non-profit making organization EPCglobal Inc. in October 2003.

RFID is an automatic identification technology that uses radio frequencies. An RFID system consists of tags (or labels), readers/antennas, and a backend system or a host. There are two kinds of tags: active and passive. Active tags have a built-in battery, and therefore can transfer a signal over a longer distance (a 100-meter range) whereas passive tags do not have a power source but derived power from incoming electromagnetic waves through their antennae by power reflection from the reader.

An RFID tag is a good medium to carry and collect data that needs to be shared among supply chain partners. A typical tag contains an EPC which has four segments (labeled as ‘E’ in the ensuing sections next), and in many cases, additional or user memory (as ‘A’). In here, we consider RFID tags that are re-writable (e.g., a passive Gen-2 tag). The proposed schemes are intended to guide partners to establish preferences when sharing data with other partners and external parties, ensuring privacy is protected and security is guaranteed. The preference of the willing sharing party is derived based on the nature of the data in three different dimensions: data sensitivity, data location, and data ownership. The coding scheme of the EPC includes four segments: a header, a company manager number, an object class, and a serial number. The header specifies the structure of the encoding on tag, allowing encapsulation of other common coding schemes, such as General Identifier (GID), a serialized version of the EAN.UCC Global Trade Item Number (GTIN) and the EAN.UCC Serial Shipping Container Code (SSCC). The general manager number identifies the company or organization that is responsible for maintaining the next two segments: object class (O) and serial number (S). In general, the combination of O and S segments can be used to identify a unique item of a product of a company. The EPCglobal Gen2 standard covers the UHF RFID tags that are reusable. User memory is also available on some tags (based on designs from TI and NXP) to allow additional data to be stored other than the EPC. The EPCglobal Architecture Framework [16] defines an architectural view of core services such as ONS, for subscribers of the EPCglobal Network. EPCIS [17] or EPC Information Services are proposed as the “primary vehicle” for subscribers such as a supply chain partner to exchange data with others (within EPCglobal Network).

“Privacy is the ability of a person to control the availability of information about, and exposure of, him- or her-self” (en.wikipedia.org). To observe the right to privacy, countries or regions define their own guidelines according to their cultures. A comprehensive guideline that comprises eight privacy protection principles that has been endorsed by 30 countries was issued by the Organization for Economic Co-operation and Development (OECD) [18]. These guidelines were adapted to protect privacy and the trans-border flow of personal data following the evolution of the Internet. RFID is a new medium that facilitates the flow and subsequent sharing of data via international data repositories. Concerns about the collection, processing, and dissemination of data using this new medium must be considered. The eight basic principles are discussed in the context of RFID adoption next.

(1) Collection limitation. Data that allows identification should be collected through lawful and fair means with the consent of the data subject. RFID tags should not provide information without the consent of the data...
subject, and high sensitivity data should not be either carried by or associated with the EPC on tags. Therefore, an appropriate design of access control and data encryption is crucial to the use of such tags. Similarly, EPCglobal should not provide information to outside parties without the consent of the data subject.

(2) Data Quality. The collected data should be accurate, complete, and kept up to date. Accordingly, only legitimate data should be written to RFID tags, and the data stored at EPCglobal Network (or Internet EPC-IS) that are associated with the on tag EPC should be maintained in good quality.

(3) Purpose Specification. Data subjects should be informed of the purpose of the data collection no later than the time of data collection. Accordingly, the data in an RFID tag can be collected when read, thus the data subject(s) must be told of and consent to the purpose of collection as well as the situation where such collection would occur. That is, even when the encrypted data in the tag can be accessed, the associated data in both the RFID tag and the EPCglobal Network should still be protected if the purpose of use has not been consented to.

(4) Use Limitation. The use of the collected data should conform to the purpose that has been specified. Accordingly, the access control mechanism in the EPCglobal Network should prevent the disclosure of data to parties that do not satisfy the purpose of use, except when the data subject consents to such disclosure.

(5) Security Safeguards. Data should be protected from unauthorized access, destruction, use, modification, or disclosure. As RFID tags are subjected to damage as they move across the supply chain, both the data (on tag) ownership and the tag ownership must take precautionary steps to protect the data from unauthorized use, especially as overwriting the data in the tag, e.g., either destroying the data integrity or rendering the tag useless. Similarly, the data in the EPCglobal Network should only be accessible to those with special privileges.

(6) Openness. The development, practice, and policies surrounding data should be open to individuals who voluntarily provide personal data. This means that personal or organizational data that are collected through RFID technology should be accessible in or via the EPCglobal Network to the data owner, be the owner be an individual or an organization.

(7) Individual Participation. Individuals or organizations should have the right to obtain and communicate with the data collectors, and to challenge and rectify the data. The EPCglobal Network should provide a due process for individuals or organizations to do so.

(8) Accountability. The data collector should be accountable for compliance with these privacy protection principles. The EPCglobal Network should be accountable to both the data collector and individuals (organizations).

3. Conclusions
Whenever new technology is invented to expedite operations, the issue of invading privacy is always raised, as occurred with the introduction of e-commerce [19] and market research [20]. However, the benefits of new technology can only be enjoyed when a balance between the protection of privacy and operational efficiency is achieved, and this is no less the case with the introduction of RFID.

The objective of this study is to design an appropriate access control scheme that uses security tools to ease concerns about privacy invasion, while allowing some degree of information sharing to expedite supply chain collaboration. Companies in a garment supply chain were interviewed to verify the design. A data sensitivity checklist, developed according to the willingness of supply chain partners to share data [21], is used to determine where data should be located in any of the five locations. An access control scheme is then complete and becoming a guideline for a partner to determine/develop preferences of data sharing based on sensitivity, location, partners and partnership. Each partner can have individual, and likely different preferences with respect to the same data due to their perception of data sensitivity and willingness to share. Some degree of modification would be needed for different industries.

This study serves as a starting point for privacy- and security-assured RFID-based data sharing, and many issues are not addressed. The proposed privacy and security-assured RFID-based data sharing, and many issues are not addressed. The proposed privacy and security-assured RFID-based data sharing, and many issues are not addressed. The proposed privacy and security-assured RFID-based data sharing, and many issues are not addressed. The proposed privacy and security-assured RFID-based data sharing, and many issues are not addressed. The proposed privacy and security-assured RFID-based data sharing, and many issues are not addressed.
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A Relationship-Based Access Control Model for On-demand Privacy and Security Entitlement in RFID-enabled Supply Chains

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Abstract

RFID adoption in supply chains is both viable in gaining on-target end-to-end visibility and crucial to sustain competitiveness. RFID-based information flow will cut across partners in business chains that extended beyond borders. Privacy and security preferences (PSP) are manifested when supply chain parties are sharing (EPC-RFID-based) data to gain visibility. The role of each party cannot be singly used to determine the preference of either party to derive the necessary entitlement for the requesting party. The preference-based entitlement must ensure data sharing is privacy-protected and security-enforced.

In this research, a Relationship-Based Access Control (ReBAC) model is proposed for on-demand privacy and security entitlement in RFID-enabled supply chains. The model includes two key concepts: on-demand preference and privacy and security scheme. Preference is governed by the two parties’ relationship, and the scheme is driven by the data dimensions (i.e., data sensitivity, data location and data ownership). RBAC is capable of addressing one party’s need to gain pre-determined permissions according to role assignment or activation. The relationship-based approach is on-demand, two-party, relationship-based preference to gain entitlement (for visibility services) with scheme-enabled privacy and security activation.

Keywords: RFID, Privacy and Security, Supply Chain

1. Introduction

The adoption of RFID technology will be extensive, both in scope globally and in participation among industries. RFID-based information flow will cut across partners in business chains (e.g., supply chains and logistics service chains) extended beyond borders. The impact of the RFID technology on e-business can be broadly identified in three aspects:

1. Effective Information Sharing. The data offered by a RFID tag with a single unique identity (SUI) enable effective information sharing with consistency and accuracy among collaborative partners, used individually to improve efficiency, and at the same time used collectively in business chains to achieve greater visibility.
2. Global Information Infrastructure. Some form of global information infrastructure must be reached, e.g., the EPCglobal network, to serve as a neutral information platform – to ensure uniformity and interoperability in RFID-based information exchange [1][8].
3. Effective Managed Information Flow. The new security and privacy concerns stemmed from the SUI-guided information flow among partners must be managed and protected without compromising trade secrets, and managed and accessible without exposing sensitive corporate data and information.

The on-demand capability concept of trading partners sharing RFID-based data and information without compromising individual privacy and security is crucial to the success of RFID adoption in business chains. The objective of the project is to enable on-demand data sharing in RFID-enabled supply chains with no inherent privacy and security issues. The objective is ascertained with the the new Relationship-Based Access Control (ReBAC) model with two key components:
1. to develop concept and model of the ReBAC which dissolves both privacy and security concerns for any two supply chain partners sharing RFID-based data,
2. to develop preference determination method based on roles of the data sharing parties and their relationship. The method will be called upon every-time when sharing is initiated, and,
3. to formulate privacy and security scheme which on one hand, helps supply chain partners to carefully place RFID-based data at EPC network and on the other hand, facilitates entitlement determination.

2. Literature Review

RFID and EPC Global

RFID is an automatic identification system that uses radio frequency technology in product tags. The advantages of RFID tags are that, unlike printed barcodes, they do not need a direct “line of sight,” and multiple tags can be identified in a short time (from tens to hundreds per second). Moreover, the tags are resistant to dirt, have a large amount of unique identifiers, and can be read (and written) by readers without being visible. However, the disadvantages are that the signals that are transmitted from the tags can be read by other equipment within range, and interference can occur when more than one reader is transmitting or more than one tag is responding. Possible consumer privacy issues are also a concern.

The encoding scheme for RFID tags refers to the Electronic Product Code (EPC), which is an identification scheme for the universal identification of physical objects. The EPCglobal Network [10], which was developed by the Auto-ID Center (now called Auto-ID Labs) to manage the EPC, includes a physical layer that captures the location of a tag and other information, and an information layer that provides the name service, such as the object name service (ONS) and the EPC Discovery Service (EPCDS) [27]. The ONS was introduced by the Software Action Group of EPCglobal (using technology that was transferred from the Auto-ID Center; www.epcglobalinc.org) and the Auto-ID Center to map RFID codes to the network addresses of the services that contain the actual data. The ONS is similar to the domain name service on the Internet, and has a hierarchical structure. An inquiry is sent to the Root ONS to locate the data owners, and the query is then re-directed to the Local ONS of the data owner, and data can be retrieved from the local EPCIS (EPC Information Service). In January 2004, VeriSign (www.verisign.com) was selected by EPCglobal to operate the Root ONS.

Privacy Protection, RFID Tags and RBAC

Privacy can be viewed as a state or condition of limited access to individuals [29]. From an information perspective, privacy deals with the proper use of what information, while security ensures the access to information is as intended. Traditionally, these issues have been studied for users of offline nature [20][32]. Online information privacy concerns have also been studied [21][30]. As RFID-tagged products reach the consumption point, privacy concerns of consumers will be of different nature. Minimal encryption techniques can be applied, or the tag can be ‘killed’ or selectively ‘blocked’. Consumer privacy issues are also a concern [22]. Before the product reaches the market, the business processes involved from raw materials to finished products in a business chain interact across corporate boundaries. Privacy issues across corporate boundaries differ to those of consumers, and those within a corporation: consumers’ concern is of case by case in an individual basis, while corporation is of a business unit’s decision among departments with a well-defined goal, versus, ad hoc or partnership decision to share with a party outside of the corporate boundary in a business chain.

To observe the right to privacy, countries or regions define their own guidelines according to their cultures. A comprehensive guideline that comprises eight privacy protection principles that has been endorsed by 30 countries can be found in [23]. Privacy protection guidelines were issued by the Organization for Economic Co-operation and Development (OECD) as early as 1980 to protect privacy and the trans-border flow of personal data.

We have looked at seven privacy protection guidelines for personal data from around the world (US, Canada, Hong Kong, Australia, Singapore, Japan, and OECD), and found these guidelines are based principally on all the eight principles. They are, 1) Collection limitation, 2) Data quality, 3) Purpose specification, 4) Use limitation, 5) Security safeguards, 6) Openness, 7) Individual participation, and 8) Accountability. These principles are useful in terms of identifying differences when considering privacy related to RFID-based data sharing.

RSA Laboratories has considered privacy issues in the air protocol [16], and the RFID systems [17]. “RFID
Privacy” was also addressed as threats as information is being shared with other enterprises, and technical solutions were proposed with respect to the control of data already on the tag, rather than what information should be stored on tag [13].

3. The Relationship-Based Access Control (ReBAC)

RFID adoption in supply chains is both in gaining on-target end-to-end visibility and crucial to sustain competitiveness. Pilot studies project the many benefits of using RFID technology in supply chain processes of a trading party with implication to foreseeable gains of both upstream and/or downstream partners. The adoption of this unique identification technology provides a pivotal (e.g., using EPC) mark to aggregate (sticky-glue) data of an item, a carton, to a shipment. Supply chain visibility at different levels can now be offered with clarity and minimal information latency. This and the possible synchronization of information, physical and financial flows in a supply chain are crucial to sustain status quo of supply chain practices, competitiveness among supply chains, and move towards supply chain supremacy in adaptability, alignment, and agility.

However, the growth in the use of RFID which enables the unique identification of objects and invisible tracking, has given rise to increased concern about the invasion of privacy. To end consumers, notable privacy threats such as leaking information pertaining to personal property and tracking the consumer’s spending history and patterns and physical whereabouts have been raised. In a supply chain, privacy and security issues of partners are of a different nature with multi-dimensional characteristics. The issues are of two-party, relationship-based, and on-demand with data characteristics of locations, sensitivity and ownership.

Role-Based Access Control (RBAC) [12] as proposed in the literature alone is not sufficient to address the on-demand preference and privacy and security scheme issues. Role-based access control (RBAC) applies policy based solely on the role of a user at the time of accessing a data source. Roles are pre-determined. Role-permission can be activated to avoid conflicts (See Figure 1). For RFID-based data and information sharing between supply chain participants access policy is applied base on their relationship of which the role of the requesting side is only one of many attributes. The access policy is further determined by other relationship attributes such as long-term vs. one-time, dominant vs. causal as well as the parties’ dual willingness to share. The relationship needs to be determined at the time of sharing as it changes over time even when data requestor’s role remains unchanged. Hence, the one-party, pre-determined, role-based access control is not applicable to two-party, derived on demand, “relationship-based” access control requirement for sharing RFID-based data.

![Figure 1. Role-Based Access Control (RBAC) Structure](image-url)
The proposed Relationship-Based Access Control model (See Figure 2) addresses two fundamental issues: 1) the on-demand preferences are manifested when two parties are sharing data to gain visibility. The role instances of these parties, other than as that inhered in supply chain participation (e.g., buyers, sellers, manufacturers and logistics service provider), are defined by the relationship (e.g., partnership, alliances, third-party agent) of the parties with respect to the request of data sharing, and 2) the privacy and security scheme that leads to the definition of access rights to the visibility services, or more specifically, the data and information needed. The scheme allows the consideration of the data characteristics with respect to its location, sensitivity and ownership. Via the scheme, an entitlement can be reached that is both privacy-protected and security-ensured.

As data can be obtained from different sources, some aggregation of the data is necessary (that is why the use of services to encapsulate both the data and the visibility rules). Thus, on-demand privacy and security entitlement is crucial in facilitating data and information sharing of trading partners in RFID-enabled supply chains. Achieving real-time visibility for partners as such information and physical flows are timely synchronized, even to the unique item level.

4. Developing the On-demand Preference Model

A Role-based Access Control (RBAC) model (as shown in Figure 1) is to allow a coordinated view of how access control can be activated and maintained with respect to the role of the requestor at the time of request, rather the actual person as he or she could assume different roles (research director and professors) in different environment (research center and department) of the same organization (a research university). In a supply chain context, the implication is a bit more complex and of a different perspective. For example, we must consider: 1) the requestor’s role which is determined with respect to his organization’s role (distribution center) in the supply chain, 2) the organization or the partner in the supply chain that is the information granter (not provider), 3) the visibility service requested (such as outbound logistics schedule of EPC 2091), and 4) the (supply chain) relationship between the grantor and the requestor. There are other factors and it is our attempt in this research to conceptualize these aspects and proposed a framework to view the data sharing privacy and security issues in a RFID-enabled supply chain.

A Relationship-Based Access Control (ReBAC) model will be proposed (See Figure 3). The model articulates the need to derive on-demand preference when the relationship of the two parties is manifested for data sharing. The scheme guides the determination of entitlement based on the role instances and data characteristics for the visibility session.
Figure 3. Relationship-Based Access Control (ReBAC) Structure

We need a mechanism for a partner to specify the privacy preference of data sharing such that appropriate access control or authentication can be effected. The Platform for Privacy Preferences (P3P) provides an insight for, in this case, how to ‘specify’ preferences for website to collect personal information of any user [27]. The dominancy is the website where a website defines what data will be collected during online usage, and the user can, based on the information, opt out on certain data collection [12]. E-P3P is an enterprise privacy preference proposed by IBM to enforce privacy protection, enabling audit trailing to allow accountability from a management perspective [1]. Data sharing among partners can be ad hoc and not restricted in the browser environment (the user of a website can choose options with an enabled browser). We have a preliminary view of what is needed in the supply chain participant’s privacy preference as follows:

<table>
<thead>
<tr>
<th>P3P</th>
<th>SAML/XACML</th>
<th>To Be Proposed Privacy Preference Templates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expresses privacy policies that human users can understand</td>
<td>Expresses (the same) privacy policies that computer systems can enforce them (in terms of computer access control mechanisms)</td>
<td>Express privacy policies that computer systems can enforce them in different locations and among different relationships manifested by partnerships</td>
</tr>
<tr>
<td>Policies at a generalized high level, in generic user and data category terms</td>
<td>Policies in terms of specific data resource identities or system-assigned resource descriptors. Policies are fine-grained and in applicable form inside computer systems</td>
<td>Different hierarchies of data resources will be defined similarly for supply chains and logistics; policies must be addressable in different levels of granularity</td>
</tr>
<tr>
<td>Expresses only privacy policies</td>
<td>Expresses, in addition to privacy policies, policies for any type of access to resources (e.g., deny or permit)</td>
<td>Privacy policies must be expressed to allow access control to be generated and can be enforceable accordingly for that partnership, that time frame, and that location of the data</td>
</tr>
</tbody>
</table>

5. On-Demand Preference Determination

The on-demand preference determination is mainly based on three key parameters, namely data location, data sensitivity and data ownership.

**Data Location.** An RFID tag is a good medium to carry and collect data that needs to be shared among supply chain participants. A typical tag contains an EPC which has four segments, and in many cases, additional memory. To create an RFID-enabled supply chain, we adopt the EPCglobal Network to the supply chain operating
environment leading to an IT architecture. According to the EPCglobal Network, there are three locations where RFID-related data are stored, namely, global and local EPC-IS [9] repositories and RFID tag. In a typical supply chain, data shared among partners are facilitated by an information infrastructure consists of an extranet and/or an intranet. We propose five data locations: RFID tags, the Internet EPC-IS (global EPC-IS), the Extranet EPC-IS (local EPC-IS), the Intranet EPC-IS (local EPC-IS), and corporate databases.

Data carried in RFID tags is vulnerable in nature, even though encryption can be applied to protect the data [18][3]. Data that are stored on the Internet EPC-IS are designed to be accessible to the public, but the data that are associated with RFID and are shared by supply chain partners on the Extranet EPC-IS and Intranet EPC-IS are for internal use only. Corporate databases are likely re-designed to house RFID-related data; while non-RFID-related data are shared using conventional approach by supply chain partners – this is not a focus of this study.

Extranet is central to data sharing of partners in a supply chain, and it is not intended for external access such as the consumers. Consumers access EPC related information via the Internet EPC-IS such as the EPCglobal Network. The EPCglobal Network, as it is now designed, is a two-tier design with global EPC-IS and local EPC-IS. When this EPCglobal Network is imposed/applied to an RFID-enabled supply chain, local EPC-IS is necessary in the Extranet (i.e., Extranet EPC-IS, or ‘EPC Extranet’) and in the Intranet (i.e., Intranet EPC-IS). Further research is needed to this new approach. For example, the issue of a three-tier (Internet, Extranet, and Intranet EPC-IS) design of the EPCglobal Network is necessary and the scalability should also be considered accordingly.

Consumers access data stored in Intranet EPC-IS via the Internet EPC-IS with an EPC obtained from an RFID tag. The Internet EPC-IS using the discovery services locates the local EPC-IS in the intranet (Intranet EPC-IS) where consumers’ owned data are stored. Highly sensitive data are not for sharing but must be accessible to the owner according to the privacy ordinance. The discovery services as prescribed in the EPCglobal Network are modeled with respect to web services. Extranet is designed for supply chain facilitation and not for parties outside of the supply chain such as the consumers.

Data Sensitivity. Data sensitivity is determined by the potential use of data (open-restricted), their association with the data subject (public-private), and the properties of data (general-specific). Data that are specific and created for internal use are highly sensitive, and therefore belong at the top of the sensitivity pyramid. A checklist can be usefully employed to carry out an analysis of data sensitivity. For example, if the data are related to personal information, then they are very sensitive; if the data can be used to identify the associated subject, then they are sensitive; and if the data are aggregated, then they can be shared without revealing individual information and are therefore less sensitive. Furthermore, the more specific and detailed the data, the more sensitive they are, especially from a product design perspective.

Through such an analysis, data can be categorized into different degrees of sensitivity, such as Highly Sensitive (HS), Sensitive (S), and Less Sensitive (LS). HS-type data are related to personal or corporate trade secrets and are not shared with outsiders; S-type data are sensitive data but can be shared with selected partners or interested parties; and LS-type data are data with low sensitivity or none that are open to outsiders by design. Thus, the determination of where data should be stored depends on the sensitivity of data, the vulnerability of the media, the nature of the data, and the efficiency of a supply chain. Intuitively, both RFID tags and Internet EPC-IS should carry only S- and LS-type data, whereas corporate databases can carry any of the data types. This is because the tags, Internet, and corporate databases are exposed to different security risks and thus have different levels of vulnerability.

Data Ownership. The owner of a RFID tag is generally the data collector who possesses the tag. However, the tag owner does not necessarily own the data written on the tag. As RFID tags are moved across the supply chain, any partner (end users) can write data on the tags, and as a result, becomes the owner of that particular piece of data. Multiple data ownerships can be found on a RFID tag. Data on tags are readable but not necessary understandable without the proper decoding privilege. It is important then to distinguish tag ownership from data ownership. The tag owner, or the data collector, has the obligation to protect the privacy of the data owners. The data owner on the other hands is responsible for the correctness of the piece of data they write. As a tag is vulnerable for damage, all owners should take proper precaution to ensure tag’s data integrity. In addition, there is another type of end users who are pure data users. Consumers are likely of that type, using data on the tag and/or obtain more information from Internet EPC-IS with the EPC on the tag.
The level of sensitivity of RFID-based (object related) data is determined by the data owner/data administrator. We agree that sensitivity is a challenging issue as we identify initially three dimensions to be considered. It is difficult to know how and when data should be shared in a supply chain and each requires a separate research effort. We conduct a preliminary research on the factors of willingness to share. We devise a procedural checklist for data administrator to determine data sensitivity and the locations; and accordingly varying schemes for access control can be designed. In this study, schemes are proposed as a guideline for a partner to determine/develop preferences of data sharing based on sensitivity, location, partners and partnership. Each partner can have individual and likely different preferences with respect to the same data due to their perception of data sensitivity and willingness to share.

6. Proof of Concept

Use cases will be used to gain an in-depth understanding of the applicability of a proposed model. Specifically, we want to assess the functionality of the two key components of the proposed model. Two use cases, based on current supply chain practices in the garment industry, will be developed in this research. The candidates for the use cases are a trim and accessories manufacturer, and a local garment enterprise (60 years in business) with OEM manufacturers in China and other Southeast Asian countries. We have worked with these parties in current RFID-based research projects (a complete RFID-enabled supply chain in the garment industry, from trims to retail stores, and RFID adoption practice in the garment industry using SCOR as the modeling tool respectively). Briefly, the use cases are described here:

1. RFID adoption in distribution from the perspective of a manufacturer: RFID tags will be used in the carton-level, and multiple cartons are common for each order; data and information sharing will be among brand name owners, the OEM manufacturers of some brand name owners, local logistics service providers (in Hong Kong and in Dongguan), and customer service offices.

2. RFID adoption in manufacturer-to-forwarder from the perspective of an enterprise serving brand owners, corporate owners and catalog owners, e.g., Brooke Brothers, JC Penny, and Lands’ End. Manufacturing plants can be found in Taiwan, China and Vietnam. The enterprise has their own fleet of trucks to make deliver from plants in China to Hong Kong forwards’ warehouses for FOB shipment to their clients. RFID tagging will be at the carton- and pallet-level;

We will borrow from other practitioners in other supply chains and logistics services providers to enrich the data sharing scenarios.

References


Implementing Inter-Organizational Knowledge Collaboration to Improve Supply Chain Performance

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Abstract

With the trend of globalization, increased customer demand and advancement in technology development, firms are seeking to collaborate with their trading partners to manage supply chain knowledge for competitive advantages. This study follows the research stream of Tornatzky and Fleisher (1990), Rogers (1995), and Iacovou et. al. (1995) to empirically analyze the drivers of Collaborative Knowledge Management Practice (CKMP) and the impact of implementing CKMP on knowledge quality and supply chain performance. The results would advance our understanding to inter-firm knowledge collaboration and provide firms with guidance to implement CKMP.

Keywords: Knowledge management; supply chain management; collaborative system

1. Introduction

In the dynamic post-industrial environment, characterized by global competition, changing customer demand, shorter product life cycles, increased market diversity, and rapid advancement in technology (Doll and Vonderembse, 1991), firms are left with no choice but to become more responsive to various external and internal changes. As firms are diving into a new wave of outsourcing key business functions to unprecedented number of trading partners, it is an overwhelm challenge to manage such complex cross functional collaboration in the supply chain. The traditional information-sharing systems, such as EDI and ERP, become increasingly powerless to address these new challenges of post industrial supply chain relationship management, because these IT systems are not equipped to sufficiently process the large volume of context-rich contents from cross functional collaboration, store and transmit tacit and experiential organizational knowledge in inter-firm work process flow. To maintain long-term competitiveness, a new set of practices must be introduced to manage supply chain knowledge assets as strategic resources, and to facilitate inter-firm collaborative decision making, so that trading partners can integrate their operations and compete as a team with other supply chains.

The supply chain knowledge can be defined as the collection of understandings, insights, and expertise supply chain partners possess regarding their markets, products technologies, and organizational structures that would contribute to the achievement of supply chain objectives (Civi, 2000). Knowledge sharing in supply chain is not a new concept in the literature. Several studies analyzed with various way of classification the type of knowledge assets being shared between supply chain partners (e.g. Pakstas, 1999; Holland, 1995; Hult et al, 2004). Lin et al (2002) also confirmed extensive amount of knowledge is exchanged across organizational boundaries in all six functional linkages of typical manufacturing supply chains.

Some other researchers (e.g. Mansell and Wehn, 1998; Skakkas et al. 1999; Cormican and O’Sullivan, 2003; Hult et al., 2004) approach supply chain knowledge by analyzing its implication to firm performance. It has been generally agreed upon that firms have no choice but to share organizational knowledge with trading partners, and the entire supply chain does benefit from knowledge collaboration in terms of end product quality improvement, time to market reduction, firm innovativeness, and transaction process optimization etc.

Despite the research community’s continuous interest in supply chain knowledge collaboration, there are only studies which are either purely conceptual or fragmented in scope. The literature lacks comprehensive research work to empirically observe the inter-firm knowledge management behaviors, until Li, Rao and Tarafdar (2008) proposed a new concept, collaborative knowledge management practice (CKMP), to capture the specific organizational activities for supply chain knowledge collaboration. The study followed the popular knowledge process perspective (e.g. Lee and Yang, 2000; Alvai and Leidner, 2001; Cormican and O’Sullivan, 2003;
Gunasekaran and Ngai, 2006; Kumar and Thondikulam, 2005-2006) to identify knowledge management activities in the entire knowledge life cycle and defined CKMP as the organizational undertaken of collectively generating, storing, accessing, disseminating and applying knowledge assets across organizational boundaries to achieve the business objectives of the entire supply chain. The purpose of CKMP is to facilitate intra and inter organizational knowledge management activities and to leverage knowledge assets collaboratively with supply chain partners.

The current study is to extend the Li, Rao and Tarafdar (2008) study and to answer the question about when organizations should get involved in knowledge collaboration with supply chain partners by exploring the adoption antecedents for collaborative knowledge management practice (CKMP). We will also examine the potential performance improvements that can be achieved from CKMP for the entire supply chain.

2. Theoretical Framework and Research Hypotheses

CKMP is fundamentally changing the philosophy of managing organizational knowledge assets. It is a business process reengineering that innovates the way organization communicates with supply chain partners. To study the drivers of CKMP, we conducted literature review based on theories and frameworks that explore technology adoption and innovation.

Many of the technology adoption studies (e.g. Agarwal and Prasad 1999, Pick and Roberts 2005, Verhoef and Langerak 2001, and Venkatesh and Davis 2000) were built on Rogers’s (1995) diffusion of innovation theory (DOI), which is concerned with the manner in which a new technological idea, artifact, or technique migrates from creation to use, and describes the patterns of adoption, explains the mechanism of diffusion, and assists in predicting whether and how a new invention will be successful (Hsu et al 2006). Rogers (1995) argued that a firm's adoption and use of innovations was influenced by both the characteristics of such innovation (e.g. relative advantage, compatibility, complexity, trialability, and observability) and organizational characteristics (e.g. centralization, formalization, interconnectedness).

To explain a firm's decision-making process for technological innovation, Tornatzky and Fleisher (1990) proposed the Technology, Organization and Environment (TOE) model. Besides technology and organizational characteristics that had been included in DOI, Tornatzky and Fleisher (1990) recognized the important role of environmental factors such as industry characteristics, organizational infrastructure that support the technology innovation, and relevant government regulations. These factors are very critical in today’s competitive business environment, because they pose as both constraints and opportunities for new technology implementation. However, one of the limitations of TOE framework was that it only covers within-a-firm innovation diffusion.

While studying seven firms adopting EDI to collaborate with their trading partners, Iacovou et al. (1995) re-organized the factors of TOE model into in three different categories and added an impact construct to study the consequences of the innovation. As illustrated in figure 1, Iacovou et al’s (1995) argued that IT system adoption had three antecedents: 1) organizational readiness: a firm must make strategic and structural preparations for substantial organizational changes coming from adopting a new technology. 2) Perceived system benefit: the firm must be able to clearly identify justifiable direct the potential benefits of the new technology before making serious commitment to the adoption. 3) External pressure is the contextual drivers that push the firm to adopt the new technology. For example, a firm will undoubtedly adopt EDI when its critical trading pattern postulates that EDI is the only way of transaction.

Although the original model by Iacovou et al (1995) was first tested in the context of EDI adoption, a considerable number of studies have applied it to other technologies, including: e-commerce (Chen, Gillenson, & Sherrell, 2002; Koufaris, 2002), digital libraries (Hong, Thong, Wong, & Tam, 2002), tele-medicine technologies (Hu, Chau, Sheng, & Tam, 1999), smart cards (Plouffe, Hulland, & Vandenbosch, 2001), and building management systems (Lowery, 2002). This model is essentially a generic extension to the theory of technology diffusion; it is thus appropriate to use it to analyze the adoption of other technology based process innovation.

Swanson (1994) classified IS innovations into three types: Type I are technical task only innovations; Type II innovations support business administration; and Type III innovations are embedded in the core of the business. According to this typology, CKMP with trading partners should be considered as a Type III innovation, because
CKMP innovate a firm’s core business processes – leveraging two-way communication to improve product offering and customer service. Swanson (1994) further examined the adoption contexts of each innovation type, and contended that typical Type III innovations often require antecedents such as facilitating technology portfolio, certain organizational attributes, perceived benefits, and external drivers that initiate the firm to adopt such innovation. This theoretical argument can be extended to knowledge management and supply chain management domain: CKMP is being enabled by information and communication technology development, requires organizational enablers, motivated by the potential benefits, and entails environmental drivers of the supply chain context. Thus, upon theoretically examining adoption contexts, innovation types, and CKMP features, we believe that the three contexts in the organizational technology adoption model are well suited for studying CKMP adoption and implementation.

The three organizational technology adoption model antecedents are explored in our model as follow:

- **Perceived benefits/relative advantage** – expectations of advantages or opportunities reflected by operational and performance improvements related to the adoption of the technology system, such as improved knowledge management operational efficiency, innovation, integrated supply chain relationships.

- **Organizational characteristics** – We approach this issue from two perspectives: technological infrastructure looks at the technological preparation of the firm for CKMP implementation; organizational infrastructure studies the whether the firm is structurally and culturally ready for CKMP adopting and implementation.

- **External influences** – Grandon and Pearson (2004) summarized the technology adoption literature and found that external influences are fairly consistent across different studies. Three dimensions of external influences are identified in our study: environmental characteristics look at factors such as environmental uncertainty, trading partner readiness and perceived external competitive pressure. Knowledge complementarity studies the perceived importance and difference of trading partners’ knowledge bases. Partner relationship is about the nature of relationship in supply chain (i.e. long term vs. one time partners).

Compared with other IS innovation, CKMP implementation is unique in that it cannot be adopted and used unilaterally. Firms that are motivated to adopt CKMP must either find similarly motivated partners, or persuade their existing market partners into adopting the practice. Moreover, even after CKMP has been adopted, firms must continue making sure the above-discussed antecedents still hold to maintain collaborative relationship with partners in KM to gain sustainable benefits.

Thus, our research will emphasize the implementation process of CKMP by limiting our subject of study to those firms that have already adopted CKMP and explore how these antecedents will facilitate CKMP and what organizational impact CKMP can bring to the supply chain.
3. Research Methodology
Survey research method was used in this study. Since our research framework includes several new constructs that had not been measured in the existing literature, we have to create instruments for these constructs, and validate the measurement model before evaluating the structural model. These new constructs include: 1) collaboration supportive culture (sub-construct of Organizational Infrastructure), 2) employee empowerment (sub-construct of Organizational Infrastructure), 3) Perceived CKMP benefits, 4) partner readiness for CKMP (sub-construct of Environmental Characteristics), 5) knowledge complementarity, 6) CKMP, 7) Supply chain knowledge quality. All other constructs are measured with instruments verified in previous research by Li (2002, 2006) and Narasimhan and Kim (2002).

Items for the new constructs were created based on extensive literature review. Then 4 professors with expertise in knowledge management, supply chain management and manufacturing management from two state universities in the US were invited to review and critique the face validity, item brevity and understandability. After a few minor revisions based on their feedback, the items were submitted to 3 pairs of supply chain professionals from a multinational manufacturing company for pre-test study. A “Q-Sort” methodology was applied in the process, where in each round, a pair of the professionals (as judges) was asked to sort from the pool of all items into different construct categorizes. Their sorting results were compared and evaluated with the inter-judge agreement level, Moore and Benbasat’s hit ratio (Moore and Benhassat 1991) and Cohen’s Kappa (Cohen 1960). The process resulted in the deletion of 1 item and revision of another 4. The final round demonstrated superior content validity of each of the 7 new constructs (inter judge agreement ratio = 94%; Moore and Benbasat’s hit ratio = 93%; and Cohen’s Kappa Coefficient = .91).

The large scale survey was administered to 4,049 procurement/materials/supply chain/operations vice-presidents, directors and managers, whose names were obtained from CSCMP member database and a mailing list purchased from RSA Teleservices.com. After 2 rounds of individualized emails to our targeted respondents, 411 valid responses were collected, yielding a response rate of 11.6%, which was considered acceptable for email surveys (Dillman 2000). Based on Chi-square comparison on firm and demographic characteristics of the responses from the first and second emails, no response bias was detected.

Table 1. Research hypotheses

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a</td>
<td>Technological infrastructure has direct and positive relationship with collaborative knowledge management practice in supply chain.</td>
</tr>
<tr>
<td>H1b</td>
<td>Organizational infrastructure has direct and positive relationship with collaborative knowledge management practice in supply chain.</td>
</tr>
<tr>
<td>H2</td>
<td>Perceived CKMP benefits have direct and positive relationship with collaborative knowledge management practice in supply chain.</td>
</tr>
<tr>
<td>H3a</td>
<td>Environmental characteristics have direct and positive relationship with collaborative knowledge management practice in supply chain.</td>
</tr>
<tr>
<td>H3b</td>
<td>Knowledge complementarity has direct and positive relationship with collaborative knowledge management practice in supply chain.</td>
</tr>
<tr>
<td>H3c</td>
<td>Partner relationship has direct and positive relationship with collaborative knowledge management practice in supply chain.</td>
</tr>
<tr>
<td>H4a</td>
<td>Collaborative knowledge management practice in supply chain has direct and positive relationship with the quality of supply chain knowledge.</td>
</tr>
<tr>
<td>H4b</td>
<td>Collaborative knowledge management practice in supply chain has direct and positive relationship with supply chain integration.</td>
</tr>
<tr>
<td>H4c</td>
<td>Collaborative knowledge management practice in supply chain has direct and positive relationship with supply chain performance.</td>
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</tbody>
</table>
Among the 411 responses, 323 were from organizations that had already adopted CKMP. Their answers were used for further instrument validation and structural model evaluation. The instrument refining processes for the 7 new constructs involved the assessment of 4 measurement parameters: 1) the dimension level item-total correlation (CITC) scores and Cronbach’s alpha; 2) the dimension level exploratory factor analysis; 3) the construct level confirmatory factor analysis; 4) the final Cornbach’s alpha reliability coefficients. Several items were dropped from the instrument in the purifying process. The final sets of measurement items for each constructs demonstrate satisfactory reliability and discriminate and convergent validity.

Because of its rigorous power to test a set of inter-related relationships simultaneously, path analysis within the LISREL structural equation modeling (SEM) framework was used to test the hypotheses of the current study. Our study displays very good structural model fit. For Overall Fit Measures, Goodness-of-Fit Index (GFI) equals .92, chi-square/degree of freedom \( \left( \chi^2 / df \right) \) is 2.86, and Root Mean Square Residual (RMSR) yields a value of .044, all well within the suggested cut-off values according to Segars and Griver (1993) (GFI > 0.90), Carmines and McIver (1981) \( \left( \chi^2 / df < 3 \right) \), and Joreskog and Sorbom (1984) (RMSR < .05). For Comparative Fit Measures, the model’s Normed Fit Index (NFI) equals .91, larger than recommended value of 0.90 (Hair et al., 1992). For Parsimonious Fit Measures, Adjusted Goodness-of-Fit Index (AGFI) was used to relate goodness-of-fit of the model to the number of estimated coefficients required to achieve such level of fit. The model AGFI also demonstrates satisfactory value (0.90), according to Segars and Griver (1993) (AGFI > 0.80). As illustrated in Table 3, out of the 9 hypothesized relationships, 7 but 2 were found significant at the 0.05 level.

4. Discussions of Structural Modeling and Hypotheses Testing Results

The significant relationships hypothesized in H1a and H1b confirmed the instrumental roles of technology tools as well as organizational factors. Undoubtedly, information systems including communication support system, collaborative system, knowledge management databases, enterprise information portal, and decision support systems function as infrastructural enablers for CKMP. Firms interested in adopting CKMP must invest in putting up these systems and commit themselves to the usage of the systems through extensive organizational planning and employee training.

CKMP involves revolutionizing the traditional way of handling organizational knowledge. From organizational behavior perspective, the initiation of adopting CKMP can be regarded as a large-scale organizational change. As what is argued by Wyer and Mason (1999), managing an organization is a people business. H1b indicated that support from top management, a positive organizational culture favoring supply chain collaboration, and employee empowerment were all critical factors in pushing through such organizational change.

Out of the researcher’s expectation, the construct of perceived benefits was not found as a significant antecedent for CKMP (H2). The result demonstrated the dynamic nature of organization’s perception at different stage of implementing CKMP: during initial decision-making stage, firms could get obsessed with the power of CKMP and over estimate its potential benefits. After making huge investment and commitment to CKMP, it was possible that these firms may find CKMP was not as omnipotent as they had expected to solve all of their business problems, particularly during the initial implementation stage when the system had not been stable and users were at the beginning of a learning curve for using CKMP. All of our respondents in the current study were firms that had already involved in CKMP. Their sense of disappointment could be exaggerated in answering survey questionnaire. The other possible reason for the non-significant relationship in H2 may due to our respondent’s role in supply chain. A considerable numbers of our respondents were medium sized non-supply chain master organizations. As indicated in the comments section of our questionnaire, they cited a major reason for their CKMP adoption was the pressure from their major trading partners (supply chain master). They were forced to implement CKMP in order to maintain partnership with the supply chain master, thus less likely to take CKMP benefits seriously.

Table 3. Hypotheses testing results
Hypotheses Relationships Standardized Estimate t-value Significant?

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Relationships</th>
<th>Standardized Estimate</th>
<th>t-value</th>
<th>Significant?</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1a</td>
<td>TI → CKMP</td>
<td>.53</td>
<td>6.95</td>
<td>Yes</td>
</tr>
<tr>
<td>H1b</td>
<td>OI → CKMP</td>
<td>.51</td>
<td>3.35</td>
<td>Yes</td>
</tr>
<tr>
<td>H2</td>
<td>BF → CKMP</td>
<td>.18</td>
<td>.72</td>
<td>No</td>
</tr>
<tr>
<td>H3a</td>
<td>EC → CKMP</td>
<td>.33</td>
<td>3.72</td>
<td>Yes</td>
</tr>
<tr>
<td>H3b</td>
<td>KC → CKMP</td>
<td>.57</td>
<td>3.32</td>
<td>Yes</td>
</tr>
<tr>
<td>H3c</td>
<td>PR → CKMP</td>
<td>.24</td>
<td>1.02</td>
<td>No</td>
</tr>
<tr>
<td>H4a</td>
<td>CKMP → KQ</td>
<td>.83</td>
<td>10.29</td>
<td>Yes</td>
</tr>
<tr>
<td>H4b</td>
<td>CKMP → SI</td>
<td>.76</td>
<td>8.86</td>
<td>Yes</td>
</tr>
<tr>
<td>H4c</td>
<td>CKMP → SP</td>
<td>.45</td>
<td>6.15</td>
<td>Yes</td>
</tr>
</tbody>
</table>

GFI = .92, $\chi^2 / df = 2.86$, RMSR = .044, NFI = .91, AGFI = .90

All t-values are significant at .05 level (t>1.65 at one tail test), if not otherwise noted.

Contextual factors are often ignored by many managers in adopting a new technology or implementing other organizational change. The confirmed positive relationships hypothesized in H3a, and H3b could raise the awareness of structurally evaluating environmental factors when planning to adopt CKMP. The current study demonstrated that in a more uncertain business context, or when experiencing pressure from trading partners and/or competitors to implement CKMP, firms are more likely to collaborate with other firms for knowledge management. There was direct and positive relationship between partner readiness and CKMP, indicating that CKMP was a multi-party attempt. Partner firms’ preparation could impact the ease of adopting CKMP and the effectiveness of implementing CKMP. Firms should also evaluate the knowledge portfolio of their own and that of their supply chain partners'. The current study found that partner firms’ organizational knowledge must supplement with each other with considerable degree of difference to motivate knowledge exchange, as well as with considerable degree of overlap so that knowledge users from different firm could share the same foundation to understand each other.

The study did not find the nature of partner relationship in supply chain a significant factor in CKMP adoption (H3c). Theoretically, an organization should not implement CKMP with every single supply chain it involves, but only with those that have strategic importance. Similar results were indicated in other studies (e.g. Ibbott and Keefe 2004; Finnegan et al. 1998) that firm relationship was positively related to inter organizational systems like CKMP. Our contradictory result may again due to the large number of non-supply chain master respondents of the current study. When an organization is force by a supply chain partner to commit to an expensive and demanding system, it is less likely that the organization would take a positive attitude toward the relationship with the one that over-shadows it. More studies with more data are required to further analyze this hypothesized relationship.

Performance consequences of CKMP were also examined in this study. Our result confirmed that by implementing CKMP, firms could improve the quality level of their supply chain knowledge (H4a). With full scale collaboration in all knowledge management activities, organizations can generate more knowledge with high accuracy, completeness, and timeliness, store and disseminate knowledge quicker and in a cost effective manner. The result justified the considerable resources and efforts that organizations must devote to adopt and implement CKMP. In dynamic business world, organizations equipped with high quality and easy to use supply chain knowledge can
afford themselves with unique competitive edge, such as better understanding to market change and agility to make adjustments accordingly.

The ultimate objective of all supply chain management activities is to improve the supply chain relationship as well as enhance its performance. H4b was found to be significant with high strength (t-value = 8.86, β = .76), indicating the implementation of CKMP a powerful approach to strengthen relationship with key supply chain partners. CKMP is a relationship building process. By implementing CKMP, supply chain partners can encourage team work spirit and promote inter-firm communication and mutual trust. H4c demonstrated that CKMP had direct and tangible effects on improving supplier performance, system flexibility to internal and external changes, and responsiveness to customer requirements etc. Therefore, supply chain managers should regard knowledge collaboration as one of the approaches to beef up supply chain performance. The research results provide theoretical basis and empirical evidence to the management, who can take as a reference to persuade partner firms to jump on board or convince shareholders for the large investment required for implementing CKMP.

5. Research Contributions

In summary, this study represents a large-scale effort to systematically investigate the issue of supply-chain-wide knowledge collaboration. By linking two popular fields of supply chain management and knowledge management, the study has made a number of theoretical and practical contributions:

First, it provided a clear definition to collaborative knowledge management practice in supply chain and identified its five dimensions: collaborative knowledge generation, collaborative knowledge storage, barrier-free knowledge access, collaborative knowledge dissemination, and collaborative knowledge generation. As Roper and Crone (2003) argued that due to the lack of clear definition to supply chain knowledge collaboration, firms found it difficult to handle cross-boundary knowledge management, even if they had realized the tremendous potential of CKMP. This definition could contribute to better understanding to cross-boundary knowledge sharing transactions in supply chain environment. It opened a new research path in supply chain relationship management. The study could stimulate more research to be done on how trading partners collaborate to leverage knowledge assets for supply chain competitiveness.

Second, the study provides valid and reliable measurement instruments to a number of constructs. Scales for these constructs were vigorously tested through statistical analysis, thus were ready to use in future research. Practitioners can particularly benefit from the instrument for CKMP. The measurement items capture various activities associated with the entire life cycle of supply chain knowledge. Organizations can use the instrument to evaluate their knowledge collaboration activities, and to identify strength and weakness in knowledge management collaboration for performance improvement.

Third, the research investigated the critical roles of a number of organizational and contextual antecedents to CKMP. Future academic researchers can use them as basis to better understand the concepts of inter-firm knowledge collaboration behaviors in supply chain and further explore factors that would facilitate or inhibit those behaviors. Business practitioners can benefits from the results by planning an adoption roadmap to successfully implement CKMP in their organizations.

Fourth, the research reveals the direct results of CKMP. It confirmed the hypotheses that exerting efforts on implementing CKMP would reward organizations with higher knowledge quality, greater level of supply chain integration between internal functions and with customers and suppliers, as well as better supply chain performance in terms of supplier performance, market responsiveness, operation flexibility and partner quality. These findings would greatly stimulate and facilitate theory development in the fields of supply chain management and knowledge management.

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The Effect of Hospital Vertical Integration on Health Care Quality in China

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Abstract

The rapid growth of hospital integration activities in China has made it critical to understand whether integration in health care markets enhanced or damaged quality. The purpose of this study is to analyze the effect of hospital integration on health care quality in Shanghai. Using difference-in-difference analysis, the authors analyze cure rate and length of stay for gastric ulcer patients. The data indicates that hospital integration has positive impact on cure rate 4 years after integration at the 10% significant, but has no significant impact on length of stay. The authors also discuss the implications of these findings and offer directions for future research.

Keywords: Integration; Health care; Quality; Length of stay; Hospital

1. Introduction

In the past 20 years, it emerges a lot of consolidation activities in the America health care industry [8]. In 1992, 42 percent of all hospitals were owned by a multi-hospital system, by 1997, hospitals owned by a multi-hospital system grew to 50 percent [4]. In 2000, Chinese government issued a series of policies to instruct the consolidation, transfer, shutdown, and take-over of public hospitals. Since then, it emerges a lot of consolidation activities in the China health care industry.

Studies of industry consolidation typically assume that the specific form of integration under consideration can be neatly categorized as either horizontal or vertical [10]. Kongstvedt defines ‘horizontal integration’ as the integration of resources along clinical healthcare delivery lines, ‘vertical integration’ as the integration of various levels of the healthcare delivery system [13]. There are two forms of vertical integration: classical integration and virtual integration. The classical form is a structure in which a single organization has ownership of all component organizations; in virtual integration, relationships are maintained between organizations with long-term, exclusive contracts, affiliations, and operating agreements rather than through ownership [5]. The current multi-hospital systems and continuums built from public hospitals through vertical integration in China are mostly virtually integrated, for example, Shanghai Sixth People’s Hospital System and Nanjing Gulou Hospital System. Vertical integration of hospitals in China mainly undergoes between tertiary hospitals, secondary hospitals and community hospitals, which are to some extent similar with foreign hospital systems and integrated delivery systems, but there is also great difference. This paper defines vertical integration of public hospitals in China as follows: it is to form a business operation continuum and a collaboration system linked by asset, management, technique or service, with tertiary hospital as the center and the inclusion of some independent secondary hospitals and community hospitals, so as to realize efficient allocation of hygienic resource and provide patients with collaborative and continuous services.

One can imagine several reasons for the pursuit of consolidations. These include increased volume or market share [10], higher prices [7] [11] [14], synergies unrelated to quantity [10] and reputation benefits [7]. Barro and Cutler speculate that large “downtown” hospitals may buy small “suburban” hospitals to increase the share of patients traveling from the suburbs to the downtown facility [2]. The corporate strategy literature points that firms integrate to compensate for incomplete markets for resources, such as brand names, management expertise or referrals [18] [6] [16] [3]. Through integration, the acquirer might gain access to the target’s resource of a close attachment to local patients and physicians; the target might gain access to specialized technology, the quality reputation of the acquirer and potentially valuable contracts with managed care payers [10].
The flurry of hospital consolidation has generated interest in determining its impact on prices, costs, and quality of care [9]. But a small numbers of studies have considered the impact of consolidation on explicit quality in health care settings [1] [9] [12]. This paper mainly use difference-in-difference analysis to study the impact of integration on the health care quality of integrated secondary hospital from two aspects: one is cure rate; another is patients’ length of stay. An examination of the impact of hospital integration on patient outcomes will provide a more complete picture of market consolidation and social welfare.

2. Methodology

2.1 Sample and Data

For this study Shanghai sixth people’s hospital system is selected. In August 2000, Shanghai sixth people’s hospital (a 1600-bed hospital located in the southern-west part of Shanghai, affiliated to Shanghai Jiaotong University), constructed a hospital system with 4 secondary hospitals. This paper selected 406 gastric ulcer patients’ data of 5 years (one year before integration, namely 1999, and 4 years after integration, namely 2001 to 2004) of two secondary hospitals involved in integration, and 93 gastric ulcer patients’ data of one secondary hospital with same scale not undergoing integration as control group. The paper selected these three hospitals because they all implemented electronic management before 1996 and the patients’ data is available. Moreover, gastric ulcer instead of heart disease was selected because gastric ulcer has large volume in secondary hospitals in China.

2.2 Empirical Framework

The issue of how to measure quality in health care is both long standing and contentious. Various potential proxies for quality have been put forward, including length of stay and mortality rates [17]. Because the mortality rate of gastric ulcer is very low in China, the paper use cure rate and length of stay to measure health care quality.

In the previous studies, many variables are used to test health care quality, such as patient characteristics including age, gender and race, clinical controls, patient volume [9] [10]. Based on the studies of prior research, this paper uses patient characteristics including age, gender, clinical controls, and patient volume as independent variables. To better understand the effect of integration, this paper applies difference-in-difference analysis which allows for time-invariant unobserved differences between integrated hospitals and control hospital, in particular it removes differences in unobserved characteristics that are constant over time.

To determine the effect of vertical integration on cure rate, this paper estimates the following specification:

\[
CUR_{ih} = \alpha_i + \beta_1 Age_i + \beta_2 Gender_i + \beta_3 VOL_{ih} + \beta_4 S_{ih} + \beta_5 B_{ih} + \beta_6 I_{ih} + \gamma Y + \delta I^* Y + \epsilon_{ih}
\]  

(1)

Where \(CUR_{ih}\) denotes the quality measure of interest for patient \(i\) admitted to hospital \(h\) in year \(t\). If the patient was cured after discharge, then \(CUR_{ih}\) is 1, otherwise is 0. \(\alpha_i\) denote hospital-specific intercept, all characteristics that do not change over the sample period will be captured. \(Age_i\) and \(Gender_i\) are demographic characters for each patient. \(VOL_{ih}\) is the volume of gastric ulcer patients of hospital \(h\) in year \(t\). \(S_{ih}\) and \(B_{ih}\) are two dummy variables, represents clinical controls for each patient. If the patient undergo surgery, then \(S_{ih}\) is 1, otherwise is 0; If the patient undergo blood transfusion, then \(B_{ih}\) is 1, otherwise is 0. \(I\) is a dummy variable, represent whether hospital \(h\) undergo integration in 2000. \(Y\) is year dummy vector to show the fixed effects of every year. \(I^* Y\) is multiple of \(I\) and \(Y\), the parameter \(\delta\) represents the effect of integration on cure rate. \(\epsilon_{ih}\) are unobserved disturbance.

We next consider the effect of vertical consolidations on patients’ length of stay. The specification is as following:

\[
LOS_{ih} = \alpha_i + \beta_1 Age_i + \beta_2 Gender_i + \beta_3 VOL_{ih} + \beta_4 S_{ih} + \beta_5 B_{ih} + \beta_6 I_{ih} + \gamma Y + \delta I^* Y + \epsilon_{ih}
\]  

(2)

Where \(LOS_{ih}\) denotes the length of stay for patient \(i\) admitted to hospital \(h\) in year \(t\). In this study, length of stay is
defined as the total number of days between admission and discharge dates for each patient. Other variables are the same as in equation (1).

3. Results

3.1 Descriptive Analysis

Table 1 provides descriptive statistics of two integrated hospitals and one control hospital.

<table>
<thead>
<tr>
<th>Variable</th>
<th>1999</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated hospitals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average length of stay</td>
<td>15.37</td>
<td>17.52</td>
<td>16.40</td>
<td>15.40</td>
<td>15.64</td>
</tr>
<tr>
<td>Cure Rate</td>
<td>70.93%</td>
<td>70.49%</td>
<td>66.67%</td>
<td>58.62%</td>
<td>56.47%</td>
</tr>
<tr>
<td>Sample size</td>
<td>86</td>
<td>61</td>
<td>87</td>
<td>87</td>
<td>85</td>
</tr>
<tr>
<td>Control hospital</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average length of stay</td>
<td>21.52</td>
<td>31.82</td>
<td>24.14</td>
<td>20.67</td>
<td>22.80</td>
</tr>
<tr>
<td>Cure Rate</td>
<td>39.13%</td>
<td>35.90%</td>
<td>28.57%</td>
<td>25.00%</td>
<td>20.33%</td>
</tr>
<tr>
<td>Sample size</td>
<td>23</td>
<td>17</td>
<td>14</td>
<td>24</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 1 shows that average length of stay of integrated hospitals is shorter than that of control hospital, and cure rate of the former is higher. In addition, cure rates are all declined during the sample period.

3.2 The Impact of Integration on Cure Rate

Logistic regression analysis (SPSS13.0) is used to estimate model (1). The regression results are presented in Table 2. The -2 log likelihood of the model is 393.212, Cox & Snell R² is 0.366, Nagelkerke R² is 0.493. The data in Table 2 shows that the regression coefficient for Age, Gender, S, I, Y01, Y02, Y04 and I*Y04 are all statistically significant at 0.1 significant level, which indicates that hospital integration has positive impact on cure rate from 4 years after integration. Thus, when cure rate is used as a quality measure, integrations do have a positive impact on health care quality.

3.3 The Impact of Integration on Length of Stay

Then, multiple regression analysis (SPSS13.0) is used to estimate model (2) to test the effect of each variable on length of stay. The regression results are presented in Table 3(R² is 0.166).
The data in Table 3 shows that the regression coefficient for Age, B, I, Y01 are statistically significant at 0.05 significant level, while Gender, VOL, S, I, Y02, Y03, Y04, I*Y01, I*Y02, I*Y03 and I*Y04 have no effect on length of stay. The data indicates that hospital integration has no significant impact on length of stay even 4 years after integration.

An examination of excessive multicollinearity and autocorrelation is performed. First, the value of Durbin-Watson is 2.023. Second, the variance inflation factors (VIF) are scrutinized and all are found to be within the range of 1.047 to 8.559. Myers indicates that only if the VIF is above 10 is there cause for concern about multicollinearity [15]. Therefore, multicollinearity and autocorrelation are well within acceptable limits and not unduly influencing the regression estimates.

4. Discussion and Implications

This paper provides an initial look at the impact of hospital integrations on patient outcomes for patients admitted to two secondary hospitals affiliated to one hospital system in Shanghai in 2000, a location and period that has seen a substantial amount of hospital integration activity in China. The data indicates that hospital integration has positive impact on cure rate 4 years after integration, but has no significant impact on length of stay. The main reason may be as following: on the one hand, through integration, the core hospital might gain access to the target’s resource of a close attachment to local patients; the target might gain access to specialized technology. The technology diffusion between core hospital and target hospital may improve the target’s cure rate. On the other hand, because of the absence of referrals system between higher level hospitals and community hospitals, patients needing long-term care and short-term rehabilitation care can not be transferred to community hospitals effectively. Consequently, hospital integration between tertiary hospitals and secondary hospitals in China has no impact on the reduction of length of stay. From this point, hospital consolidation should develop closer ties with community hospitals.

The limitation of this analysis is that it only studied one hospital system in Shanghai. To generalize the findings, more samples should be included, and this may be the future research.

References


E-Business and New Venture Strategies that Impact Firm Performance

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Abstract

The recent surge of new venture creations and failures has led practitioners and researchers to identify the factors that impact new venture performance. One major research stream in the strategic management literature suggests that new venture strategic decisions are critical to their success. Research on new venture strategies has experienced limited success and beckons the call for more substantive studies. Failures of new ventures are often linked to their limited resources or ability to attract the needed resources and finding specific strategies to launch e-business ventures. Given the recent rise of technology ventures in transitional economies it represents an opportunity to examine the new venture strategy impact on the environment-performance relationship. The model presented in this paper is designed with the transitional economies in mind as the backdrop for testing the model. A brief literature review on environments, e-business, and new venture strategies is developed. A model framing the environment, new venture strategy, e-entrepreneur and performance is offered. Propositions describing the relationships of the variables in the model are developed. Finally, conclusions and implications for future research are discussed.

Keywords: E-Business Entrepreneurship

1. Introduction

The recent surge of new venture creations and failures has led practitioners and researchers to identify the factors that impact new venture performance. New ventures are often identified as newly established firms or those with less than seven years of existence. A number of recent trends in electronic businesses have motivated many entrepreneurs to enter the market and craft strategies to exploit the opportunities. One major research stream in the strategic management literature suggests that new venture strategic decisions are critical to their success. The new venture must determine the manner they align their strengths and weaknesses with the opportunities and threats in the task environment representative of the specific industry where their venture conducts business [16]. Some researchers have discovered that new ventures that enter the marketplace with aggressive marketing strategies and broad targeted markets are more successful than those with narrow target markets [19][29].

New ventures tend to have limited resources and a lack of legitimacy compared to the large more established firms who have been in existence for a longer term. Stinchcombe characterized new ventures as a ‘liability of newness’ with a high propensity to fail because of their limited resource capabilities. Others have noted that new ventures are highly dependent on environments for resources critical to their success [10][22]. However, it is also obvious that new ventures have capabilities that are niche specific possessing speed and flexibility to exploit certain industry opportunities more readily than large, established firms [8][25]. The Internet has been filled with new ventures exploiting niches that large firms deem unprofitable or time consuming. Some have suggested specific strategies for those entering the internet arena. The specific strategies an entrepreneur should pursue when launching their e-business venture includes: 1) presence: ramp-up stage to build excitement about the e-business venture in the marketplace, 2) penetration: the hyper growth stage to gain market share, and 3) the managed growth stage to expand revenue. Regardless, the strategies new ventures adopt to manage and influence their environments will impact the overall performance of the firm.

The literature has offered two primary competing perspectives on the environment and strategies firms choose to adopt. The two perspectives are environmental determinism and environmental management. The environmental determinism supporters tend to view the environment as a deterministic influence and firms make strategic choices by adapting to opportunities and threats in the environment [1][12][27]. Porter [23] points out that innovative and differentiation strategies are often found in dynamic and uncertain environments. Similarly, industrial organization and population ecology researchers claim that environmental determinism conditions influence a firm’s strategic choices [27][12].
In contrast, environmental management researchers suggest that firms’ craft and implement strategies to best manage their environments for critical resources and gain a competitive advantage [6][32]. Lenz [13] points out that as firms’ craft strategies specific to customers that prove successful competitors will often imitate them as a retaliatory strategy and thereby changing market competition within the industry. Thus, the environmental management perspective implies that firms may employ reactive or proactive strategies as a means of influencing the environment positively to affect venture performance. Although there has been past research on the environment-strategy-performance relationship, there has been limited research examining the impact of new venture strategy on the environment and how it affects venture performance. More specifically examining new venture strategy as a moderator variable.

Research on new venture strategies has experienced limited success and beckons the call for more substantive studies. Failures of new ventures are often linked to their limited resources or ability to attract the needed resources. Peng and Heath [21] point out that that problem is more prevalent for new ventures in transitional economies than in market economies. They suggest that new ventures in transitional economies like Russia, China, and Brazil are more constrained by limited technical, managerial and marketing capabilities than those in market economies like the U.S. Thus, there is a gap in examining new venture strategies in transitional economies as opposed to market economies. Given the recent rise of technology ventures in transitional economies it represents an opportunity to examine the new venture strategy impact on the environment-performance relationship [2][33]. Bruton and Rubanik [2] suggest new research in the context of new ventures in transitional economies is an opportunity to advance new venture theory. The model presented in this paper is designed with the transitional economies in mind as the backdrop for testing the model.

The paper is a response to a call to further exploratory research in new venture strategies and their performance implications [4][17]. A brief literature review on environments and new venture strategies will be developed. A model framing the environment, new venture strategy and performance is next offered. Propositions describing the relationships of the variables in the model are presented. Finally, conclusions and implications for future research are discussed.

2. Literature Background

As previously noted firms depend on resources and information from their environments critical to their success. New ventures face many potential hazards in terms of limited resources, lack of environmental knowledge, industry data, vendor support, and customer preferences. Because new ventures have limited or no performance records their potential for success is also limited. Thus, environments have a major impact on new venture performance. New ventures tend to examine their environments in terms of opportunities and threats. Dutton and Jackson [9] identify opportunities and threats as two strategic categories confronting firms. These two categories seem especially critical for new ventures because of their limited track records.

Environment: Opportunity

Prior research suggests that the environment plays a critical role in shaping the resource opportunities of new ventures [10]. Gartner [11] points out that the creation and exploitation of the environment by a new venture is pursuing an opportunity. The creation and exploitation of the environment depends on new ventures assessing market discrepancies or niches and then pursuing the essential resources to leverage the opportunities [26].

Industry growth has been identified as a key element of market attractiveness. Generally the more attractive the industry growth then the more likely new ventures enter the industry and grow. Porter [23] suggests that new ventures entering high growth industries will provoke less response or retaliatory strategies from incumbent firms and have more potential for succeeding. Miller and Camp [19] even suggest that new venture entrepreneurs seek high growth markets to minimize the effects of competitive pressures. Chandler and Hanks [5] found that market attractiveness is positively related to new venture growth.

Pfeffer and Salancik[22] point out that industry growth also indicates environmental munificence. Environmental munificence represents the extent critical resources required by new ventures are available in the environment. New ventures are more likely to obtain critical resources in high growth industries than they could otherwise in low growth industries. The opportunity for growth minimizes some of the competitive pressures. Research shows that
venture capitalists prefer to invest in new ventures in high growth industries [14][25]. Electric business (e-business) is the new wave in creating new ventures and transacting business. Other researchers point out that high growth industries do have some limitations. Many firms may be entering the industry simultaneously thereby diminishing the luster for venture capitalists and the success for new ventures [16][29]. Regardless industry growth represents an important environmental dimension that typifies an opportunity for new ventures.

**Environment: Threat**

Threats represent the second environmental dimension critical for new ventures. Stinchcombe [28] referred to special difficulties that new ventures face in acquiring critical resources as ‘liabilities of newness’. Liabilities of newness pose threats to new venture success if they are not managed well. Threats come in many different forms to new ventures. For example, new technology ventures often require substantial financial resources in the early stages while developing their technology. The ‘cash burn’ rate or rate that cash is spent will often exceed their revenues. In fact, there may be no revenues for extended periods imposing questions of firm survivability. Technologies that are rapidly changing in industries may bring unanticipated consequences that derail the new venture and its potential for success [30]. Also, because new ventures often lack industry and environmental knowledge as well as not having strong relationships with customers and suppliers their legitimacy is weakened [28]. Consequently, new ventures are in a risky and vulnerable market position. They are susceptible to many threats from multiple stakeholders that threaten the new venture’s performance. Another threat is simply the integration of business processes electronically via information and communication technologies. A key challenge for new ventures is to minimize these threats and position their firm for success in the marketplace. These conditions are often described as environmental hostility by researchers [7][29]. Thus, environmental hostility is one way of examining the industry and stakeholder threats confronting the new venture viability and performance.

**Electronic Business**

The electronic entrepreneur deals with information. Information is anything that can be put into a digital format, for example, photographs, text, catalogs, data, movies, stock quotes, and online MBA classes. Information is intellectual property and can be protected using copyrights, trademarks, or business-method patents. Finally, information must be experienced for people to determine its quality and benefits. Information can be expensive to generate, but it is almost costless to reproduce. Therefore, selling information provides great margins, unless it is reproduced and resold by others. Information also has different uses for different people. Different versions of information can be offered to different customer segments. By segmenting the market, an entrepreneur can extract maximum value – the most profit from his or her property. E-businesses have many value drivers or ways of creating value through their operations and strategies. They include: business to business (B2B), business to customer (B2C), business to business to customer (B2B2C), roll-ups, advertising models, pay-for-content models, affiliate models, and mash-ups. E-business encompasses various modes of internet use that include e-tailing (virtual storefronts), electronic data interchange (EDI), e-mail, and ensuring the security of data transactions. All of these facts about information are embodied in the strategies of e-entrepreneurs. Thus, there are a number of key strategic options that e-entrepreneurs need to consider as they form their businesses and marshal resources and capabilities for their firms.

**New Venture Strategy**

New venture strategies have been described and examined by researchers in various ways [10][16][24]. Some researchers use product innovation as a means of examining new venture strategy [5][10]. They define product innovation as the degree new ventures develop and introduce new products and services into the marketplace. Zahra and Covin [31] measured product innovation by new product development, rate of change of products, speed and variations in new products developed. The product innovation strategy reflects a venture’s proactive approach to entering the industry and minimizing competitive pressures.

Market differentiation is another dimension of examining new venture strategy. Market differentiation refers to the extent a firm pursues a strategy based on unique venture attributes matched to the market opportunities [18]. Unique marketing efforts extend to personal networks that the entrepreneur brings to the marketplace that distinguishes or improves the venture performance [20].
Market breadth is a third dimension of examining new venture strategy. Market breadth refers to the scope of the market that new ventures are attempting to capture or serve. McDougall and Robinson [17] measured breadth by the variety of customers, geographic range, and the number of products offered. They suggest that providing a broad range of products to a large customer base is an important component of new venture strategy. McCann [15] lend further support by suggesting that market breadth is an important variable for inclusion in any new venture research.

Finally, marketing alliance is another dimension for identifying new venture strategy. Bucklin and Sengupta [3] refer to marketing alliance as the lateral working relationship between a venture and its competitors in one or more aspects of marketing. They measure marketing alliance by the new venture’s emphasis on marketing complementary products, designing and manufacturing of new products, introducing new products, promoting new products, providing support services and pricing collaboration with other firms. Their study demonstrates the importance of marketing alliances and how those alliances allow a new venture to manage critical resources or lack of them in changing markets. Other researchers suggest marketing alliances enable new ventures to obtain concrete and abstract resources that improve the venture’s market position [10]. The concrete resources include specific skills and finances to manage the venture while abstract resources include firm legitimacy and market acceptance.

These four dimensions represent the conceptualization of the new venture strategy to be included the model. They represent the fundamental strategic choices for new ventures in a variety of environmental settings. They also have prominence in the strategic management literature that fits equally well in the new venture field of study. The four dimensions should be equally useful in examining new venture strategy in transitional economies.

### 3. Proposed Model

Figure 1 contains the proposed model that offers a framework for examining the role of new venture strategy in the relationship between its environment and venture performance. The primary dimensions of the environment are industry growth, e-businesses, and environmental hostility. The model integrates the environmental determinism and environmental management perspectives as a means of examining how entrepreneurs adapt to their environments and be proactive to exploit opportunities available. It is proposed that environmental determinism will play a mediating role for new venture strategy while environmental management perspective will play a moderating role for new venture strategy. In the model industry growth hostility is representative of the environmental determinism perspective while environmental hostility represents the environmental management perspective.

The environmental determinism perspective assumes that new venture strategy takes an adaptive response to the environment. More importantly it will mediate the impact of the environment on the new venture performance. Assuming there are niche opportunities in the environment affordable to viable ventures then the new venture will need to adapt certain strategies to transform these opportunities into achievable performance. Having the right venture attributes matched with the industry opportunity will enhance the venture’s acceptance in the marketplace. Tsai et al. [29] noted the mediating impact that new venture strategies may have on performance. They state that new venture strategies will mediate a positive impact for return on investment of environmental munificence in terms of product life cycle. Contrastingly, the new venture strategies will mediate a negative impact on market share of environmental hostility. They concluded that environment and strategy separately affect new venture performance.

The environmental management perspective offers an alternative view about the impact of new venture strategy on the environment affecting venture performance. A hostile environment may have adverse effects on the new venture and give cause for developing different strategies to cope. New venture strategies will seek options and risk minimizing alternatives to absorb uncertainties in the environment that may adversely impact the new venture’s performance. New venture strategies are developed that proactively reduce the negative impacts and enhance the positive elements of the environment. Thus, the environmental perspective suggests that new venture strategies play a moderating role in the environment that affects venture performance.
4. Propositions

Based on the literature background several propositions are offered that address the different roles of new venture strategy in the environment affecting venture performance. The propositions are developed focusing on the transitional economies as the backdrop for testing the model.

P1: There is a positive relationship between environmental determinism and performance when new venture strategy is a mediating variable in transitional economies.

P2: There is a positive relationship between environmental management and performance when new venture strategy is a moderating variable in transitional economies.

P3: There is a positive relationship between industry growth and venture performance when mediated by new venture strategies.

P4: There is a positive relationship between e-businesses and venture performance when mediated by new venture strategies.

P5: Product innovation will positively mediate the relationship between industry growth and venture performance.

P6: Market differentiation strategy will positively mediate the relationship between industry growth and venture performance.

P7: Market breadth strategy will positively mediate the relationship between industry growth and venture performance.

P8: Market alliance strategy will positively mediate the relationship between industry growth and venture performance.

P9: The negative relationship between environmental hostility and venture performance will be mediated by new venture strategies in transitional economies.

P10: Product innovation will moderate the negative relationship between environmental hostility and venture performance.

P11: Market differentiation will moderate the negative relationship between environmental hostility and venture performance.

P12: Market breadth will moderate the negative relationship between environmental hostility and venture performance.

P13: Market alliance will moderate the negative relationship between environmental hostility and venture performance.

The propositions developed reflect the possible relationships and their impact for examining the role of new venture strategy in the context of the environment and e-businesses. The new venture strategy is treated as a means of mediating or moderating the environment for best performance by the new venture.
5. Conclusion and Future Research Implications

The model proposed offers a framework for examining the role of new venture strategy and its relationship with the environment and e-businesses. More specifically, the mediating and moderating roles of new venture strategies that interact with environments to impact venture performance are examined. The mediating role of new venture strategy is developed in the context of industry growth as one environment that new venture strategy can mediate. It is further suggested that product innovation, market differentiation, market breadth and market alliance strategies mediate a positive effect on new venture performance in an environment with industry growth. In addition, e-businesses mediate a positive effect on new venture performance especially in information-intensive industries. McDougall et. al. [17] suggest that aggressive venture strategies are necessary to achieve better venture performance in a rapidly growing industry.

However, new venture strategy can also play a moderating role in the context of environmental hostility. The model suggests that when new venture strategies are emphasized and are the strongest then the negative impact of environmental hostility on new venture performance is weaker than otherwise can be expected. Romanelli’s [24] study reaffirms the proposition that new ventures with aggressive strategies are more likely to improve or enhance their survivability in a hostile environment.

The literature is replete with research suggesting how industry and market conditions lead new ventures to adopt different strategies for best performance [4]. The literature is not firm on how these strategies deal with environments to best manage them or the best matches for success. The model proposed offers a framework to consider and test new venture strategies that deal with environments to impact venture performance. By examining the environment from two different perspectives new venture strategies are offered to generate the best venture performance. Each of the two perspectives shapes the way firms deal with environments. In one case, new ventures adapt to their environments as their entrepreneurs assess and respond to the environment or industry conditions. In the other case, new ventures have the capacity to enact their environments or industry and can be more proactive in managing their environments.

The proposed model is an attempt to advance new venture theory. Primarily, the model suggests that the two environmental perspectives be integrated to better understand the impact of new venture strategies on performance. In addition, the model suggests there are more ideal matches of new venture strategies with the environment that may lead to the best venture performance. The model offers a framework for testing these matches and their relationships among the new venture strategies and different environmental perspectives.

Transitional economies offer an ideal setting for testing the model because of their underdeveloped institutional frameworks. Transitional economies have been ignored in past research and offer a rich environment for testing new venture theory. Further, new technology is being developed in the transitional economies that provide industries representative of industry growth and potential. Finally, the richness of transitional economies offers researchers an opportunity to examine new venture activity in an environment other than market based economies where so much research has been conducted in the past.

References

Systems Alignment: Linking Tertiary Institution Learning Modes and Graduate Attributes to Business Enhancement

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Abstract
In recent years moves towards flexible learning have taken many forms across the tertiary institution sector. Along the way, many formats and approaches have been trialed. Previous research has examined influences between tertiary learning modes and student outcomes, or the influences between student outcomes and graduate students’ employability. This paper takes a holistic view, and develops a Business Value Enhancement Model, which maps the tertiary institution learning offerings to student learning outcomes, and to business enhancement (delivered by employed graduate students).

Keywords: Flexible learning, flexible delivery, blended learning, traditional learning, student outcomes, business deliverables, marketing, university education, strategy, competitiveness

1. Introduction
Tertiary institutions are seats of instruction for those seeking to acquire latest high levels of knowledge and skills [4][5]. Tertiary institutions deliver education to their student body. They up-skill and train students by developing their ability to: (1) action plan and develop enhancement measures; (2) take action and implement the enhancement measures; (3) evaluate the impacts of enhancement measures; (4) learn and assimilate a better understanding of the learning enhancement processes; and (5) diagnose the impediments successful learning enhancements [39].

Holsapple and Lee-Post’s [39] tertiary institution learning cycle is similar to Shewhart’s 1920’s ‘plan-do-check-act’ quality cycle for business (in Finch [29]). In the business setting a product and / or its quality of service, are both recognised as variable. By employing Shewhart’s quality cycle in conjunction with various statistical, tracking and analysis tools, the variability in both products and servicing may be controllable. This approach also has application in the tertiary education sector. Here, student knowledge application solutions are continually revamped to best capture the learning requirements of the student cohort, and to align these with the requirements of both the external environment and the business world [30].

To build appropriately aligned, knowledge-application solutions, tertiary institutions have developed a raft of learning modes, either traditional or flexible [21][33] and these, in-turn, may affect performance outcomes of the students. These measures (capturing teaching and learning effectiveness) are related to the student learning processes.

2. Tertiary Institution Modes of Learning
At the tertiary level, learning may be split into three modes – traditional, blended or hybrid and flexible. Traditional learning is captured in the classroom context [7][31][50][54]. Here, direct contact with the teacher frames the educational context. Face-to-face teaching and learning combined with real-time interactivity delivers typically low levels of student learning control, while teacher-student and student-student interactions are high [7]. Traditional learning may also be segmented into two streams: (1) the face-to-face form as described above; and into (2) the ‘blended’ or ‘hybrid’ form where on-line learning is used to extend the face-to-face model into a distant, yet supportive, learning mode.

Blended or hybrid learning may be defined as the combination of on-line delivery and face-to-face contact [6][9][32][75]. Thus, blended learning has some overlap with the traditional face-to-face learning mode. In this paper we will use blended learning to also capture the term hybrid. Typically, at the tertiary level, an on-line learning tools – like Blackboard (http://www.blackboard.com), is engaged as the primary distant learning delivery mode. Blackboard is a common tertiary learning system that engages both teachers and students across a purpose-built, on-
line, course materials website, and it may even do so with a degree of student ‘interactivity’ and ‘individuality’. By employing aspects of ‘interactivity’ like on-line teacher-student engagement activities, and ‘individuality’ such as personalised actions and response requirements, the Blackboard on-line approach may be incorporated to help move the traditional face-to-face tertiary learning mode closer to its customers [55]. There are many other complementary on-line learning channels available to the tertiary sector. For example, live e-learning, video conferencing, blogs, wikis, email, instant messenger systems, podcasts, facebook (www.facebook.com), secondlife (www.secondlife.com) and the many on-line learning tools are all available to compliment the traditional face-to-face learning process. Currently, student communities seek a balance to their work-life-family commitments [52], and such flexible modes of learning are often likely to have a degree of appeal to the more independent learner [73].

An extension of the blended mode of tertiary learning is the broader ‘flexible’ delivery mode. Bryant et al. [10] suggest that flexibility generally offered choices in the learning environments such that the course of study offered better met the needs of individual students. Collins and Moonen [15] expand this view and suggest flexibility across the various tertiary learning modes includes: class time, course content, instructional approach, learning resources, location, technology used, entry and completion dates and communication media. Hill [38] portrays flexibility as a mix of two pathways: (1) flexible delivery – with close associations to blended learning, and (2) flexible learning – with high degrees of pathways flexibility, and of relative pathways strengths.

Flexible delivery focuses on options regarding access for learners. Flexible delivery encapsulates ‘the what’, ‘the where’, and ‘the when’ of the learning occurrence [38]. It is concerned primarily with the management and administration of the provision of access, content, delivery style, logistics and productivity [64][69].

In contrast, flexible learning captures the options relating to ‘how’ the learning process occurs [38]. Flexible learning focuses on the individual student’s processes, and targets the learner’s quality experiences. These may be captured as the learner’s personal characteristics, learning style, work responsibilities, learning needs and desires and personal circumstances [56][59] [65]. Collis and Moonen [14] listed five dimensions to flexible learning as: (1) flexibility related to time; (2) flexibility related to content; (3) flexibility related to entry requirements; (4) flexibility related to instructional approach and resources; and (5) flexibility related to delivery and logistics. Thus, ‘flexible delivery’ may be viewed as an overlapping sub-set of the blended mode and of the flexible modes of tertiary learning.

Today, there remains a range of tertiary institution learning modes, and these fit along a continuum into three broad learning mode categories: (1) traditional or face-to-face learning; (2) ‘blended’ or hybrid learning; and (3) flexible learning. The term ‘flexible delivery’ as described above is not seen as a fourth mode of learning, but as an overlapping of blended and flexible learning.

3. Measurement of Student Learning

Many options are available to measure and assess performance across tertiary student learning. For example, the institution and its resources may be benchmarked [67], the teaching staff may be measured [24][70], the delivery approaches may be assessed [18], the ranking and locality may be interpreted [24][70], the student outcomes may be assessed [5], or the business enhancement due to graduate student contributions may be analysed [53]. Barrie [5] presents the student’s learning outcomes, delivered by the tertiary institution, as generic outcomes including: (1) graduate student attributes; (2) core or key skills; and (3) generic skills. In Australia these generic graduate student attributes are regraded as the skills, knowledge and abilities of the graduate student, and they are perceived to be beyond the normal disciplinary knowledge (applicable in a range of contexts), and acquired as a result of completing any tertiary institution degree.

4. Graduate Student Delivered New Business Enhancement

The above student outcomes areas may be considered as student-acquired, tertiary-learned skills (typically cognitive, interactive, and motor skills), and these, in-turn, are linked to the business-deployed graduate student skills, and into the relevant business types where the graduate students often find their initial employment [19][48]. Cully [19] suggested the way students chose to participate in tertiary education was also driven by a perception (or expectation) that the skills they each acquired were beneficially deployable into their preferred choice area of business. Harvey [34] articulated that a university degree was but one passport into graduate student employment. In 2000, Harvey [35] further suggested that employers’ sought a graduate student skills-set of attributes, with real abilities to both...
transfer, and apply knowledge, and with the ability to apply the student skills learned at the tertiary institution into the workplace. He stated such student additions to the business may deliver additional successes in the workplace, and that UK employers were using such graduate attributes as a recruitment tool measures [35]. Thus, the tertiary institution provided, and the acquired student learning solutions, would likely be of more value when they closely matched with the business requirements, and particularly when they delivered added value or enhancements to the business. These graduate students provided business enhancements, were also perceived to generate a level of increased satisfaction within the business, and this satisfaction measure may also extend back through the student’s acquisition processes to the tertiary institution’s learning deliveries. Martin et al. [53] found that tertiary graduate students’ satisfaction with their tertiary institution was influenced by their perceived levels of employment preparation, and their tertiary acquired ‘competencies’ set. Hence, employee performance (and particularly graduate student performance) in the workplace, was also related to business performance, and it may also be considered as a business enhancement measurement block. These performance areas – business and employee, capture the learning mode contribution of the graduate student and they also contribute to overall business satisfaction, and to the overall enhancement of the business.

Hence, regardless of what mode of learning delivery is employed by the tertiary institution, both the skills and attributes that facilitate student education and graduate student employment transitions (and also engender subsequent graduate student career progression) remains a primary educational focus [57]. The tertiary institution learning mode processes are linked to student learning deliverables, and then to a new graduate student, employee-delivered business enhancements set. This new employee business enhancements set is measured via a set of graduate student employee performance and business performance contributions, and a resultant business satisfaction measure.

5. The Business Value Enhancement Framework

The tertiary institution learning modes are linked to a set of business deliverables via the students’ tertiary institution acquired skills set and these approaches and components may be consolidated into a conceptual framework model linking the tertiary institution learning modes, the student outcomes and the graduate-student-employee business enhancement deliverables. The resultant conceptual framework termed ‘The Business Value Enhancement Framework’ is displayed as Figure 1. Figure 1 shows the relevant tertiary institution delivers a student-acquired learning skills-set that relates to future employment areas, and this student learning skills set, in-turn, may be mapped against a graduate-student-employee-delivered set of business enhancement measures.

The tertiary learning delivery modes used to engage the student, are captured under the university ‘Mode of Offers’ measurement block.
Flexible delivery focuses on options regarding access for learners. Flexible learning encapsulates ‘the what’, ‘the where’, and ‘the when’ of the learning occurrence, and also ‘how’ the learning process occurs [38]. Typically it captures offering choice in the learning environment so that a course of study better meets the individual needs of students [74][38]. Collis and Moonen [14] argued that flexible learning is more than just online learning or e-learning, or distance education. It involves providing options in course resources, in types of learning activities, in media to support learning, and many other possibilities. In summary, flexible learning is about learner choice in different aspects of learning experience. Collis and Moonen [14] identified 19 dimensions of learning flexibility that encompass the two perspectives articulated by Wade et al. [74]. They group these options into five blocks: (1) flexibility related to time; (2) flexibility related to content; (3) flexibility related to delivery and logistics; (4) flexibility related to instructional approach and resources; and (5) flexibility related to delivery and logistics.

This research investigates whether different tertiary learning modes deliver different levels of student exit deliverables. The student learning outcomes block is grouped into two groups – student perceived learning, and student learning outcomes delivered. Allen et al. [1], McFarland and Hamilton [8], Lockyer et al. [47], Neuhauser [58], Thirunarayanan and Peres-Prado [71], and Reisetter et al. [61] have compared on-line teaching with traditional teaching and have found no significant difference between student learning outcomes and student satisfaction. Thus both are determinants of these modes. However, learning outcomes may vary in student characteristics, student attributes and student learning experience. Reisetter et al. [61] also found difference existed in acquired learning experiences and learning skills. Sun et al. [68] investigated e-learning user satisfaction measures. They found course quality, course flexibility, perceived usefulness, perceived ease of use, and diversity in assessments were critical factors affecting learners’ perceived satisfaction.

The drivers of student perceived learning developed from the literature, typically capture learning satisfaction, learning experiences, learning value, learning quality and student learning outcomes.

- Learning satisfaction typically measures expectations, needs, desires or experiences, success, value adds, eco value, services, skills sets, perceived learning usefulness, and the like [2][13][39][43][68].
- Learning experiences captures course delivery flexibility, perceived experiences usefulness, perceived ease of use, relevancy, interactions or socializing with peers, interactions with instructors [3] [23][26][49][68].
- Learning value houses perceived economic value such as perceptions on: obtaining a good job, good investment (value for money), student skills achieved (matched to employer requirements) [2][40].
- Learning quality resides under a range of measure typically capturing dimensions of: global applicability, perceived teacher quality, perceived course and content quality, system quality, technology quality, information quality, service quality [2][13][39][43][46][68].
- Learning outcomes delivered by the tertiary institution are typically observed as graduate student attributes, core or key skills; and employability skills. Boyatzis and Kolb [8] matched the employers’ skills profiles to the employers’ professional accreditation requirements, and developed a set of skill profiles for graduate students. Kretovics [45] and Duke [28] refined the above into a list of desirable learning outcomes – typically categorized as leadership skills, communication skills, interpersonal skills, analytical skills, decision-making skills, technological skills, information gathering skills and behavioural skills (like initiative, goal seeking and action).
Curtis and McKenzie [20] examined employability skills for Australian industries. They matched the graduate attributes of tertiary institutions with employers perspectives of skills amongst university graduates. They identified the key employability skills as: communication, problem solving, analytical interpersonal and leadership, initiative, ethics and social responsibility, and independent learning. These key employability skills were consistent with those of Boyatzis and Kolb [8].

In 2007, Precision Consulting in conjunction with Business Industry and Higher Education Council of Australia identified best practice for integrating, developing, and assessing and reporting on employability skills nationally and internationally [16]. They developed an ‘Employability Skills Framework’ listing a set of key capabilities. These captured communications, teamwork, problem solving, self management, planning and organizing, technology, life-long learning and initiative and enterprise. Thus, the literature indicates a link between the business and its perception of its tertiary institution graduate students (as employees), and between the tertiary institution sector itself, and it suggests that both contribute to business enhancement [16]. In short, tertiary education is clearly linked to business enhancements through the learning outcomes it delivers to its graduate students, and business enhancement may then be grouped into three performance fields: employee performance, business performance, and business satisfaction with employee contributions.

Harvey [35], Hesketh [37], Nabi and Bagley [57], Heath and Mills [36], and Cleary et al. [16] looked at employers graduate student selection processes and their relationship to the tertiary institution’s deliverable education package. Graduate students, with a broad range of personal deliverables, and with solid self-reliance skills, were seen desirable. They further note that employee deliverable business benefits were also desirable. Such measures contributed to business satisfaction, and may be constructed into an employee performance determinant.

- Employee skills have been investigated and tabulated by Silva and McFadden [63] the skills are prioritized and commence with key fields like problem solving, verbal communications and listening.
- Employee business deliverables to the business capturing product and brand quality, specific knowledge, skills and expertise, organizational involvement and teamwork, entrepreneurship and suitability, costs, loyalty and satisfaction are captured by Chen [11], Spiteri and Dion [66], and Tomkovick et al. [72].

Business performance resulting from graduate employee contributions also contribute to business satisfaction, and are captured as:

- Service encounter quality, and as service quality scales [41].
- Business performance measures like adds valuable information; leading teams; ability to choose correct options; ability to use tools and enhance tools [22].
- Business perceived value of graduate student training and courses [42].

Many of the above researchers have related learning satisfaction to the tertiary institution’s learning deliverables. It is projected that learning satisfaction will also relate to business enhancement - as measured by employee performance and business performance and to business satisfaction. Satisfaction may be captured as

- career opportunities, compensation, relationships with colleagues, work deliverables [17].
- relevant knowledge; responsibility and independent learner [44].
- net organization benefits [12] and
- business loyalty [25].

The above measures condense into the Business Value Enhancement Model, as shown in Figure 2. The Business Value Enhancement Model is currently under test as a ‘systems alignment barometer’ for tertiary institutions. The model shows the linkages between the tertiary institution delivery modes, the major student skills and perceptions related blocks, and the business’s perception of its enhancement due to graduate student contributions.
6. Discussion

Thus far the ‘Business Value Enhancement Model’ has been developed empirically, and the alignment modes have been established. The measurement indicators have been empirically identified, and this will be empirically analysed using a structural equation modeling approach. The model depicts fourteen projected factor blocks and possibly two mediating variables. Assuming the measurement items build onto one factor each, and that factor score regression weights offer suitable factor loadings, then an alignment model is projected to emerge. It is projected that the business enhancement, created by the graduate student’s perceived performances, will be affected by either, or both, the tertiary institution learning modes offered, and by its student-perceived, tertiary-acquired, learning acquisition set, and by its student-perceived, tertiary-acquired, skills outcome set.

7. Areas for Future Research

For tertiary institutions this empirically-developed ‘Business Value Enhancement Model’ offers the opportunity to determine the effectiveness of its education to work transitions, and to assess if the much-discussed drive towards flexible learning modes actually delivers the successes that are sometimes muted. This approach also offers the opportunity to assess alignment issues over a longitudinal study. Further comparisons between cooperating tertiary institutions may also be possible. Hence, by engaging a Business Value Enhancement Model’ approach at the tertiary level, additional realignment and more competitive approaches may be released across management, marketing, innovation, communications, and services. This in turn may deliver new pathways to tertiary institution strategic positioning, and it may offer a possible customized delivery solution which in-turn may capture an additional market. However, it remains up to the tertiary institution as to how it chooses to absorb and adapt to such generated competitive information.

8. Conclusions

This paper builds a Business Value Enhancement Model for the tertiary education sector. The model links the tertiary institution environment and its resultant student learning outcomes set to the business environment. This model is to be empirically tested using a structural equation modeling approach. The model is projected to identify
significant pathways between the contributing factors. The model is design to assist tertiary institution to better align their education deliverables to the requirements of businesses.

A close alignment between the tertiary institutions offerings and the business requirements is projected to enhance the graduate student’s employability. Further, to improve the alignment, tertiary institutions may use the Business Value Enhancement Model to indentify and adjust contributing factors. Such identified factors may be used by the tertiary institutions to reposition, or realign, or possibly redesign delivery modes (and even course structure) with the view to deliver the required graduate student learning outcomes pertinent to businesses.

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Quality Dimensions for B2C E-Commerce

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Abstract

Organizations have still not realized the full potential of e-commerce. One factor that is likely to influence the further adoption of e-commerce is the quality of the e-commerce system as system quality impacts user satisfaction and hence use of the system. However, in order to improve the quality of any systems, one first needs to identify measures to assess quality. Although other researchers have recognized the need for such measures, they have primarily focused on a single specific aspect of e-commerce systems, typically the user interface. In this paper we identify the key components of e-commerce systems and synthesize existing research related to quality of these components to arrive at a comprehensive list of quality dimensions, which in turn provide measures to assess the quality of e-commerce systems.

Keywords: e-commerce systems, quality dimensions

1. Introduction

The OECD (2002) defines electronic commerce (e-commerce) as the sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organizations in which goods and services are ordered over the Internet, even though the payment and the ultimate delivery of the good or service may be conducted on or off-line. E-commerce has the potential to play a pivotal role in many organizations [11] [19]. It can change the way in which organizations interact both with their customers and their suppliers and offers the potential for certain organizations to considerably improve the efficiency and reliability of a number of their business processes [31].

There are different types of e-commerce, the most important for the purposes of this paper are B2C and B2B e-commerce [11] [31]. B2C commerce involves online retailing transactions with individual customers while B2B commerce concerns transactions between business corporations [11]. In this paper, we concentrate on B2C e-commerce systems.

Despite their potential, B2C e-commerce systems have not been as widely accepted as one might expect. For example, Pavlou et al. [25] point out that although B2C commerce has existed for over a decade the uncertainty of the online environment still makes many consumers reluctant to engage in online exchange relationships with sellers. One of the reasons for this may be a lack of quality, where we define quality as “fitness for use” [36] [37] [39] [41]. As with other information systems, organizations can only fully realize the benefits of e-commerce systems if they ensure that their systems display a high level of quality [40]. For example, quality is likely to affect user satisfaction and user satisfaction in turn affects use [7] [8] [13]. Therefore, by focusing on the quality of their systems, e-commerce system developers may increase use and hence help organizations to more fully realize the benefits of e-commerce systems.

However, the level of quality of an e-commerce system can only be assessed if it can be measured, and since quality is a multi-dimensional concept [40] there is a need for a set of quality measures for e-commerce systems. Moreover, as Moody [18] points out, most approaches to quality evaluation decompose quality into lower level characteristics (dimensions) as this makes it easier to measure. These dimensions can further be broken down into sub characteristics which can then be measured by quality metrics, leading to the need for a hierarchy of quality dimensions.

Defining a comprehensive set of quality dimensions for e-commerce systems has many benefits. For example, the list is likely to be of value to academics and practitioners as they try to develop a more thorough understanding of the e-commerce phenomenon [20] [34], as well as to designers, who can use the list as a checklist to identify the quality dimensions that are likely to be relevant to the system under development. Moreover, a well-defined set of quality criteria is likely to improve the sharing of data across organizations, as organizations will be more willing to share data if the quality of that data is known [27]. The latter is especially
important for B2B e-commerce.

The importance of e-commerce system quality has not escaped researchers. For example, a number of researchers identified user interface quality dimensions for e-commerce systems [15] as well as other factors affecting the adoption and acceptance of e-commerce systems [1] [22] [24]. This paper draws on this literature but goes beyond that to look at other information system quality literature. The starting point is that e-commerce systems typically incorporate components that it has in common with other types of systems, such as knowledge management systems, data warehouses, and so on. The quality dimensions defined for these components are therefore also relevant to e-commerce systems and previous work on the quality dimensions of these components can therefore be used to derive a more comprehensive set of quality dimensions for e-commerce systems.

This paper is organized as follows. In Section 2 we derive a generic architecture for B2C e-commerce system and identify a set of components that e-commerce systems share with other information systems. In Section 3 we discuss literature on the quality of the components we identified. In Section 4 we propose and justify a more comprehensive set of quality dimensions that can be used to assess the overall quality of e-commerce systems. Finally, Section 5 concludes the paper.


As stated in the introduction the two major types of e-commerce are business to business (B2B) and business to consumer (B2C). He et al. [11] focus on the role that agents play in these two types of e-commerce. For the purposes of this paper, we restrict ourselves to the consumer behavior buying model that He et al. [11] develop for B2C e-commerce (see Figure 1). The process starts with the consumer identifying a need (need identification). Based on that need a consumer determines what to buy (product brokering). Once this stage is complete the customer decides who to buy the product from (merchant brokering), a process that this may or may not be preceded by a buyer coalition formation in which buyers try and form a grouping in order to approach the merchant with a larger order, presumably in order to obtain a discount. Once the merchant has been identified, the terms and conditions under which the sale will take place must be negotiated. This is followed by the purchase and delivery phase. In the final stage the product is put into service and evaluated.

![Figure 1. Consumer behavior buying model [11]](image)

We use the model above to help motivate a generic architecture for a B2C e-commerce system (depicted in Figure 2). While the role of most of the components identified in figure 2, and their relationship to He et al’s [11] model will be clear, it is useful to draw attention to the agent component. Agents can be used to enhance a number of processes involved in the purchase of a product [19]. For example, during the product brokering phase, agents can be used to perform roles similar to that of a human salesperson (i.e. personalized product recommendation, thus providing a mechanism to overcome information overload incurred when shopping in an Internet marketplace [5], and helping customers decide which products to purchase [28] [29]. Most recommendation systems require the use of analysis techniques (e.g. data mining), and this in turn requires that the analysis agent interface with a set of data and knowledge stores. These stores can be created and maintained both by extracting data and knowledge from sources as well as by storing the transactions that are processed by the e-commerce system. The product and service evaluation phase will also produce data and knowledge that, if stored, could be used to improve the product brokering and merchant brokering phase. Similar benefits may also be gained by using the agent analysis subsystem and data and knowledge stores in the other brokering and negotiation phase(s).
Another component that is worth elaborating on is the ontology, a component that has been identified as critical in e-business applications [9] [17] [19] [21] [26]. An ontology consists of descriptions of the terminology used in a domain and other domain specific information. It establishes a common vocabulary and allows different agents to interact [21], and allow them communicate in a semantic way, exchanging messages which convey information according to explicit domain ontologies [19]. For example, a brokering agent may employ a disambiguation agent that uses the terms in the ontology to assist it in accomplishing its mission. By using standard terminology as defined in the ontology, the brokering agent can identify similar products offered by other companies, even though they may described in different terms than those used by the customer.

![Architecture for an e-commerce system](image)

**Figure 2. Architecture for an e-commerce system**

### 3. Relevant Literature

As shown in the previous section, e-commerce systems typically encompass a number of components (e.g. data and knowledge Stores, ontologies, user interface). There are definitions of quality dimensions many of these components and these can be used to define quality dimensions for e-commerce systems. However, because of their special nature, there are additional quality-related issues that are peculiar to e-commerce systems. Trust and risk are two important such issues. Moreover, existing theories related to IT acceptance and adoption (e.g. TAM, TPB and Agency Theory) have been used to help explain the reluctance of consumers to engage in e-commerce [1] [22] [23] [24] [25], and can therefore also be used to derive quality dimensions for e-commerce systems.

#### 3.1 Data and Data Warehouse Quality Dimensions

Since data storage and data warehouses are important components of e-commerce systems, quality dimensions related to these are relevant to e-commerce systems as well. Jarke et al. [12] discuss how to extend the data warehouse architecture model to support explicit quality models, and define a set of hierarchically characterized quality dimensions for data warehouses, including design and administration quality dimensions, data usage quality dimensions and data quality dimensions. Design and administration quality is broken down further into schema and data quality and metadata evolution. Schema and data quality include correctness, completeness, minimalism, traceability and interpretability. Data usage quality is decomposed into accessibility, which includes availability and security, and usefulness which includes interpretability, responsiveness and timeliness. Timeliness is further broken down into currency and volatility. Data quality includes completeness, credibility, accuracy, consistency and data interpretability.

Other relevant work is the definition of a rigorous set of data quality dimensions that are anchored in ontological foundations [38]. The purpose of these dimensions is to provide guidance to system designers on data quality.

3.2 Knowledge Management Systems Quality Dimensions

Rao and Osei-Bryson [26] identify a set of quality dimensions for knowledge management system (KMS) and categorize them as relevant to either the ontology, knowledge items, knowledge retainers (or sources) or the usage of the KMS. Quality dimensions related to ontology include accuracy or correctness, clarity or interpretability, completeness or coverage or comprehensiveness, consistency, infrastructure quality, lawfulness, metadata evolution, minimaly, purpose quality, relevance, richness, security quality, strategy quality, traceability. The knowledge item quality dimensions include accuracy, consistency, currency, data interpretability/degree of context, volatility, degree of importance/relevance of knowledge in the system/usage, degree of detail, sharing, and usefulness. Quality dimensions related to knowledge retainers include accuracy, authority/expertise, credibility, consistency, degree of detail, history/reuse/relevance, degree of context, security, accessibility, willingness to share, sharing, usefulness, and degree of socialization. Finally, the dimensions related to usage include accessibility, availability, completeness/coverage, ease of use, integration quality, interpretability, level of sharing, quantity of new knowledge generated, relevance, responsiveness/efficiency and security (access rights).

3.3 Interface Quality

Palmer [20] identifies key metrics for identifying elements of successful web site design. He concludes that download delay (speed of access and display rate), navigation (organization, arrangement, layout and sequencing), content (amount and variety of product information), interactivity (customization and interactivity) and responsiveness (feedback options and FAQs) all contribute to web site success. Pavlou and Fygenson [24] add information protection to this list of technological characteristics but argue that consumer skills, time and monetary resources, and product characteristics (product diagnosticity and product value) also influence e-commerce adoption.

Kim et al. [15] argue that existing data quality approaches have focused on the content of the information (e.g. relevance, accuracy, and completeness) and have not addressed interface-related aspects of information presentation and end-user delivery, an important issue for e-commerce systems. More specifically, as it relates to presentation and delivery, some of the core aspects (e.g. the usability challenges of disorientation, irrelevant information, and cognitive overhead in e-commerce systems) have not been addressed. Kim et al. [15] propose an E-Quality (EQ) framework for e-business that addresses the three problems of disorientation, irrelevant information and cognitive overhead. This data quality framework incorporates three quality dimensions each consisting of three quality constructs, namely information content, which consists of information accuracy, information relevance and information completeness, form, which consists of interface structural quality, information packaging quality and information accessibility, and time, which consists of history maintenance quality, information delivery quality and information currency.

3.4 Risk and Trust

Risk and trust significantly affect the adoption of e-commerce [14] [22] [23] [24] [32]. Trust can be defined as a quantified belief by a trustor with respect to the competence, honesty, security and dependability of a trustee within a specified context [10], while risk can be defined as a probability of a failure with respect to the context of the interaction (e.g. nonpayment for service, a security failure or service failure) [10]. In general, higher risk implies less trust.

Jones et al. [14] argue that the full benefit of e-commerce can only be realized if trust develops between the various stakeholders (businesses, consumer, etc.). However, they point out that the new context of e-business calls for a new understanding of trust and the factors that lead to the establishment of trust. For e-commerce systems trust is no longer just an issue of dependability as was traditionally the case (i.e. safe, reliable, available and secure). Businesses and consumers may consider the system to be completely dependable in terms of the traditional dimensions yet may still not trust the system with their business or personal interests unless there is some legal framework they can call on. Additionally, businesses now need to trust not just their own systems but also those of their partners and the infrastructures used for establishing their communication. Jones et al. [14] group these requirements for trust into those relating to ensuring the identity and reliability of e-business stakeholders (stakeholders); those concerning the quality and protection of digital assets (information); and those about the dependability of services and systems (infrastructure).
So and Sculli [32] list a number of trust-related issues that arise in the context of e-commerce and mobile commerce, including: privacy and security on the web, online customer service quality, product delivery and the return of online purchases. Sztompka [35] propose three dimensions for the evaluation of trustworthiness, namely reputation, performance and appearance (sometimes referred to as image).

3.4 Relevant Theories

A number of studies have sought to explain the acceptance and adoption of e-commerce through the use of a number of existing technology adoption theories. Thus, Pavlou [22] seeks to predict consumer acceptance of e-commerce by combining the constructs of trust and risk with those of the technology acceptance model (TAM) [6]. The motivation for this study is the assumption that once there is uncertainty, as is common in e-commerce, trust and risk will play an important role in the technology’s acceptance. Pavlou [22] argues that the lack of trust in e-commerce is one of the main reasons why it has not been more widely accepted. The uncertainty of using a global open infrastructure coupled with the distant and impersonal nature of the online environment makes risk a relevant factor in e-commerce acceptance. Creating trust in e-commerce will reduce the uncertainty and risk associated with the possible opportunistic behaviour of a Web retailer. Pavlou and Dimoka [23] propose the use of social networks to build trust between the buyer and seller and to overcome the uncertainty caused by the impersonal and distant nature of digital auction marketplaces.

Pavlou and Fygenson [24] extend the theory of planned behaviour (TPB) to explain and predict the adoption of e-commerce by consumers, focussing specifically on how customers get information from the Web vendors and purchase products. They state that not only are trust and technology adoption variables (perceived usefulness and ease of use) important as salient beliefs for predicting e-commerce adoption but also that technological characteristics (download delay, Website navigability, and information protection), consumer skills, time and monetary resources, and product characteristics (product diagnosticity and product value) add explanatory and predictive power. Pavlou et al. [25] extend the agency theory and use it to better understand the nature of uncertainty. These findings can then be used to reduce uncertainty and increase B2C e-commerce adoption.

Ahn et al. [1] investigate the effect of playfulness on user acceptance of online retailing and tested the relationship between Web quality factors and user acceptance behaviour. Their justification for studying playfulness is that customers obtain pleasure in using the system as well as in purchasing the needed product. The results show that playfulness plays an important role in enhancing user attitude and behavioral intention to use a site. Web quality, which is categorized into system quality (e.g. interface design, functionality, response time, etc.), information quality (e.g. data format, completeness and timeliness), and service quality (i.e. how well a delivered service level matches customer expectations) has a significant impact on the perceived ease of use, playfulness, and usefulness, and consequently, that it encourages website use in the context of online retailing.

4. Model of E-commerce Systems Quality

Based on the generic architecture of an e-commerce system introduced in section 2 and the subsequent discussion of the existing quality literature section 3, we derive a comprehensive set of quality dimensions for e-business systems.

It is important to point out that a number of quality dimensions in the existing literature overlap, even as authors may use different terms. For example, Kim et al. [15] define information currency as the temporal accuracy of information content and links on Web pages. This is similar to currency as defined by Jarke et al. [12] and Rao and Osei-Bryson [26]. On the other hand, different authors often use the same term to refer to different concepts. For example, Rao and Osei-Bryson [26] define availability as the availability of the knowledge in the system, while Jarke et al. [12] define availability as the percentage of time the source or data warehouse system is available. The latter definition more closely resembles the Kim et al. [15] concept of completeness, defined as the availability as needed of the information content and hyperlinks within Web pages for users to complete specific tasks in an effective manner.

We have attempted to resolve this ambiguity of terms by synthesizing the literature to derive a comprehensive list of dimensions for e-commerce quality and have provided the justification for this classification (i.e. the literature that supports these dimensions). The quality dimensions will be discussed from the perspective of the agents embedded in the system, the customer and other users.
4.1 Agent

In order to fulfil their roles, agents in e-commerce systems rely on the data and knowledge stored in the system, the ontology and the metadata (see Figure 2). The quality of an agent thus is dependent on the quality of these entities, and we can use quality dimensions defined in the literature for each of these components to formulate quality dimensions for agents in e-commerce systems.

4.1.1 Ontology-Related Quality Dimensions

An ontology has been recognized as an important component of e-commerce systems. The following ontology-related quality dimensions can be used for e-commerce systems.

- **Accuracy/correctness**: The extent to which the ontology reflects the real world domain, i.e. the number of conflicts with real world domain.
- **Authority**: The reusability of the ontology for other applications. This would be applicable in cases where ontologies of different organizations may need to be combined or merged.
- **Clarity/interpretability**: The clarity of the context of the concepts and relationships. This is extremely important since the user will be browsing the ontology.
- **Completeness/coverage/comprehensiveness**: The extent to which the ontology covers the concepts, the relationships and business rules in the domain.
- **Consistency**: The consistency of the meaning of concepts, relationships and business rules used in the ontology.
- **History**: The longevity of the ontology.
- **Knowledge sharing quality**: The extent to which knowledge is shared by different user groups (communities of practice). The ontology can be seen as a way of standardizing the knowledge.
- **Lawfulness**: In order to automate the search process the ontology and knowledge stores must be represented in a format that supports automation.
- **Metadata evolution**: The evolution of the ontology. It is expected that the ontology will change. If it is understood why/how these changes occurred it will provide further context.
- **Minimality**: The number of concepts or relationships representing the same thing.
- **Purpose quality**: The ability of the ontology to convey the purpose of the organization.
- **Relevance**: The relevance of the concepts and relationships to at least one knowledge task for the given organization and/or industry.
- **Richness**: The breadth of concepts/terms used.
- **Security quality**: The ability of the system to protect the critical knowledge (e.g. infrastructural, cultural, strategy knowledge) stored in the ontology.
- **Strategy quality**: The extent to which the ontology reflects the strategy of the organization.
- **Traceability**: The reasons for the design of the ontology and the changes made to it.

4.1.2 Quality Dimensions Related to Knowledge Items

Agents access and create knowledge which will be stored as knowledge items in the system. We therefore apply the following dimensions for knowledge item quality.

- **Accuracy**: The accuracy of the knowledge extraction process and the knowledge items.
- **Consistency**: The level of consistency of the knowledge items in the system, both from different sources, and between knowledge items extracted from a source and the business rules.
- **Currency**: When the knowledge item was discovered by the knowledge retainer and verified to be accurate.
- **Data interpretability/Degree of context**: The number of interpretable knowledge items. The more context provided for a knowledge item the more it can be reused and the more value it has.
- **Degree of detail**: The deeper or broader the knowledge the higher the quality.
- **Degree of importance/relevance/usage**: What the knowledge item is used for. Some knowledge is more important to an organization depending on the significance of the task it is used for.
- **Sharing**: The diversity of user groups that access a given knowledge item.
- **Usefulness**: The usefulness in new knowledge creation. If a knowledge item is used in the creation of a number of different types of knowledge then it is likely to be of high quality.
- **Volutility**: The time period for which the knowledge is valid.
4.1.3 Quality Dimensions Related to Knowledge Retainers

Knowledge items are stored in knowledge retainers. We can therefore rely on the identification of a set of quality dimensions for knowledge retainers.

- **Accuracy:** The accuracy of the knowledge retainer.
- **Authority/Expertise:** The level of expertise of the retainer, and hence the credibility. A retainer may have different levels of authority for different concepts.
- **Consistency:** The consistency of knowledge across retainers.
- **Credibility:** The credibility of the retainer.
- **Degree of detail:** A retainer may have knowledge about a number of concepts or it may have detailed knowledge about a particular concept.
- **History/reuse/relevance:** The usage or relevance of the retainer.
- **Sharing:** The diversity of user groups that access a retainer.
- **Usefulness:** The usefulness in new knowledge creation. If a retainer is used frequently in the creation of knowledge then it could be seen as being of a high quality.

While the above apply to all knowledge containers, there are additional dimensions that only apply to some, depending on whether the knowledge retainer contains codified or personalized knowledge [30]. Codified knowledge refers to knowledge that is stored in explicit form, while personalized knowledge is knowledge of the people within an organization. The following dimensions pertain to retainers of codified knowledge.

- **Degree of context:** The reasons for the creation of the knowledge retainer. The more context that is provided for a knowledge retainer the more it can be reused and the more value it has.
- **Security:** Preventing unauthorized access to knowledge in a retainer.

The following concerns retainers of personalized knowledge

- **Accessibility:** The accessibility of the retainer. Humans can be inaccessible for a number of reasons e.g. sick, holiday, unwillingness.
- **Degree of socialization:** The level of socialization of the person.
- **Security:** Preventing persons from disclosing critical knowledge of the organization.
- **Willingness to share:** The extent to which experts are willing to share their knowledge.

4.1.4 Schema-Related Quality Dimensions

Agents access databases or warehouses to help in their processing (e.g. data mining) [3] [16]. Each database or data warehouse will have a set of schemata and there are schema-related quality dimensions [12], including the following.

- **Correctness:** Number of conflicts to other models/real world.
- **Completeness:** Level of coverage, number of represented business rules.
- **Minimality:** Number of redundant entities/relationships in a model.
- **Traceability:** The extent to which the designer’s requirements and changes are recorded.
- **Interpretability:** Quality of documentation.

4.1.5 Data-Related Quality Dimensions

As the agents access data bases, their quality will be influenced by the quality of the data in the data bases. Therefore, data-related quality dimensions are relevant here as well.

- **Completeness:** The percentage of the real-world information entered in the sources and/or the warehouse.
- **Credibility:** The credibility of the source that provided the information.
- **Accuracy:** The accuracy of the data entry process which happened at the sources.
- **Consistency:** The logical coherence of the information.
- **Data Interpretability:** Data description i.e. number of tuples with interpretable data.

4.1.6 Quality Dimensions Related to Metadata Evolution

The use of data warehouses, databases and knowledge bases produces metadata that if stored can provide valuable insights for administrators. Therefore this should be considered when considering quality [12].
4.2 Customer

In addition to agent-related quality dimensions, there are a number of customer-related quality dimensions. Some of these dimensions are related to the technical details of the system (e.g. download delay), some are related to the usage of the system (e.g. ease of use, playfulness) and some are related to social issues (e.g. risk and trust). The dimensions and the literature support for these dimensions related to customers are specified below.

- **Trust**.
- **Risk**.
- **Satisfaction**: The quality of the product or service is directly linked to satisfaction [32].
- **Value**: The ratio or tradeoff between quality and price [32].
- **Perceived Usefulness (PU)**: The degree to which a person believes that using a particular system would enhance his/her job performance [6].
- **Ease of Use (EOU)**: The degree to which a person feels that using a particular system would be free of effort [6].
- **Perceived behavioral control (PBC)**: People's perceptions of their ability to perform a given behavior [2].
- **Playfulness**: The belief that interacting would result in enjoyment [1].
- **Accuracy**: Freedom from mistakes in the information content and hyperlinks provided within Web pages [15].
- **Relevance**: Pertinence to users' interests of the information/knowledge content and hyperlinks provided within Web pages based on a query. [15] [26].
- **Completeness**: Availability of the information content and hyperlinks for users to complete specific tasks in an effective manner [1] [15] [26].
- **Availability**: The percentage of time the system is available [12] [26]. Jones et al. [14] refer to this as reliability.
- **Interpretability**: How effectively a variety of information in various media types is packaged within the Web interface for presentation to end users [12] [26]. Similar to what Kim et al. [15] termed information packaging quality and Ahn et al. [1] termed data format.
- **Privacy and Security**: [12] [14] [24] [26]. Jones et al. [14] break down security into: authentication, confidentiality, non-repudiation, integrity. This has been categorized as dependability [14]. Pavlou and Fygenson [24] address this when they consider information protection under technological characteristics.
- **Timeliness**: The temporal accuracy of information/knowledge (content and links). Captures the notion of age of information/knowledge which can be measured by the amount of time that has passed since it was last updated [12] [15] [1]. Kim et al. [15] have categorized this as information currency. Jarke et al. [12] have broken this down into currency and volatility.
- **Responsiveness**: The ease and efficiency with which a user can access and retrieve desired information [12] [25] [1] [26]. Similar to what Kim et al. [15] have termed information accessibility. Pavlou and Fygenson [24] have discussed this under technological characteristics (e.g. download delay, navigability).
- **Interface Structural Quality**: Primarily comprises interface consistency and structural awareness. Interface consistency implies consistency in the structural arrangement and style of information content and hyperlinks within an e-business application. Structural awareness implies that the interface makes the user aware of the larger structure of the information content in the Web pages in the e-business application [15] [1].
- **History Maintenance Quality**: The flexibility and comprehensiveness of features that an e-business application provides to its users for specifying and maintaining history of user actions and data and system states of the application [15]. Similar to metadata quality [12].
- **Information Delivery Quality**: The flexibility and comprehensiveness of features that an e-business application provides to its users for specifying and controlling the temporal relationships among the various hypermedia components for effective delivery of integrated hypermedia information to users [15].
- **Integration quality**: The ease with which information/knowledge can be added to the system [26].
- **Safety**: Non-occurrence of catastrophic events that threaten human life, health and the environment (e.g. virtual hospital) [14].

4.3 Other Roles

Apart from the customer there are a number of other types of primarily technical users who have an interest in the quality of the e-commerce system. Since each of these types of user focuses on certain components of the
system, the quality dimensions derived from those components are most directly relevant to them. Thus, the system administrator focuses essentially on all the components of an e-commerce system, including the data and knowledge stores, metadata, the ontology, the agent, querying tools and the overall system. The quality issues relevant to system administrators therefore include data and knowledge quality, system availability and responsiveness, metadata availability, ontology security, and refreshment efficiency, among others. The system designer is primarily concerned with the data stores and source schemas, the knowledge stores, metadata associated with each and the software that drives the various agents. The quality issues relevant to this role are therefore those that are related to schemas, knowledge retainers, metadata, ontology and those related to agents. Application programmers write the code for various components in the system. As such, they are primarily concerned with the software that drives agents and metadata. The primary quality issues of concern to this role therefore include those relevant to agents and metadata. Finally, the data source administrators are responsible for the data and knowledge sources in the e-commerce system. Their major quality related concern therefore is system availability.

5. Conclusions and Future Work

This paper provides a comprehensive set of dimensions for assessing the quality of e-business systems. Although recent research has begun to recognise the need for a comprehensive list of quality dimensions for e-commerce systems [33] the majority of research has addressed quality issues for specific aspects of e-commerce systems (e.g. user interface). Identifying this comprehensive set of dimensions will allow practitioners and researchers to more fully understand the e-commerce phenomena and, if addressed, will help realize the net benefits that these systems can provide.

Not all the dimensions identified in this paper are applicable to all e-commerce systems. For example, e-commerce systems that do not recommend related products to customers probably may not need to include a data mining component and data warehouse related quality criteria may therefore not be relevant. Therefore, depending on the components that are included the designer can identify which dimensions should be considered. The dimensions proposed in this paper therefore constitute a checklist for designers. In future work we intend to validate these dimensions by using them to evaluate existing e-commerce systems.

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Hawaiian Identity and Collectivism Predict the “Ideal Virtual Team Personality”

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Abstract

Previous studies have linked trust with virtual team performance. In turn, trust is predicted by high levels of extraversion, agreeableness, and conscientiousness. Previous research indicates that individuals high in these three traits are ideal virtual team members due to the higher levels of trust and consequent performance they display in virtual teams. In the present study we set out to determine predictors of this “ideal virtual team personality” in a multicultural setting, the University of Hawaii at Hilo. Our results show that the higher an individual is in Collectivism and Hawaiian Identity, the more likely they will possess the “ideal virtual team personality” profile that leads to better trust and performance in virtual teams.

Keywords: Virtual teams, trust, collectivism, Hawaiian identity, personality

1. Introduction

With the increasing availability of technology, it has become easier to make use of virtual teams. Virtual teams, composed of members who are geographically dispersed, interact primarily via information and telecommunications technologies. Virtual team members are expected to share information, brainstorm and negotiate alternative solutions to problems, and produce output which may be in the form of a report or a delivered product.

Previous studies have identified the importance of trust in virtual teams as well as characteristics that impact trust. Team members who score higher in extraversion, agreeableness, and conscientiousness report higher levels of trust in virtual teams and are more successful. In this study, we take a look at the impact of Hawaiian identity and the role of collectivism in a culture on Big Five personality dimensions that impact trust in virtual teams.

2. Literature Review

Trust has been identified as an important component in virtual team success [28] [51]. It is defined as “the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party” [34]. A lack of trust exists when one party does not have faith in the competencies of another or questions the motivation of the other to take the promised action as seriously [50]. So, trust can be seen as a relationship between two or more individuals in which one perceives that the others are involved, are competent, will complete their fair share of the work, and will make an honest effort to meet commitments.

Trust is important in teams because it lowers transaction costs [52]. Those who do not trust fellow team members are more likely to monitor or double check one another’s work to insure the quality of the team’s output. This self-protective activity increases the amount of time and resources needed to complete a project. While trust is important in all teams, it is crucial in virtual teams where members generally do not meet face-to-face.

In virtual teams, trust becomes an important component in preventing psychological distance [42] and it increases confidence in relationships by promoting open information exchange [27]. Previous studies have suggested that trust in virtual teams is influenced by communication [19], level of conflict [15], and personality characteristics [20] of individual team members. While the human personality is complex, studies over the past 75 years have attempted to categorize the elements of personality.

2.1 The Big Five Personality Framework

McDougall [38] launched the systematic effort to organize a taxonomy of personality. He analyzed various personality dimensions and came up with five factors that he titled intellect, character, temperament,
disposition, and temper [38]. For the next 40 years, researchers continued efforts to expand on McDougall’s work, finding that their data fit well with minor modification of the five dimension model [4, 6-9, 17, 23, 40, 48, 49]. Two of these studies stand out as important. First, Borgatta’s [4] study identified five stable personality factors even when several different methods were used to gather the data. Second, Norman [40] formally labeled the dimensions as extraversion, emotional stability, agreeableness, conscientiousness, and culture and from that point forward, they have been referred to as “Norman’s Big Five”, the “Big Five”, or simply the “Five Factor Model”.

Since the 1980s, research has identified compelling evidence for the robustness of the five personality dimensions across different occupational categories [1, 2], theoretical frameworks [21], using different instruments [11-13, 35-37], and with different cultures [39].

2.2 The “Ideal Virtual Team Personality”

Three of the Big Five personality dimensions, extraversion and agreeableness and conscientiousness, have been identified as indicators of trust in virtual teams [20]. Extraversion refers to the quantity and intensity of an individual’s interpersonal activity [5]. Individuals with high levels of extraversion are sociable, gregarious, assertive, talkative, energetic, and optimistic while individuals with low extraversion are more reserved, independent, and quiet [1]. Extraversion has been found to be positively correlated with levels of participation in computer-mediated teams [3, 43] even though it did not impact satisfaction with the group’s process [44].

Agreeableness can be defined as the degree to which an individual is helpful, cooperative, good-natured, sympathetic and tolerant of others. Individuals low in agreeableness are characterized as egocentric, competitive, irritable, and skeptical of other’s intentions [5].

Conscientiousness encompasses individual differences in planning, organizing, and executing tasks. Individuals high in conscientiousness are purposeful, determined, reliable, organized, and strong-willed. Individuals low in conscientiousness are more lackadaisical in working toward goals, careless, aimless, and unreliable. Conscientiousness is positively related to the careful and thorough accomplishing of tasks on the job [1]. Individuals high in conscientiousness have been found to have a strong sense of purpose, obligation and persistence which helped them to perform better than those who were low in conscientiousness. These individuals showed enhanced performance in vigilance tasks [32].

In summary, previous research has shown that trust impacts virtual team performance and that the personality dimensions of extraversion, agreeableness and conscientiousness impact trust in virtual teams [20].

2.3 Context of the Present Study

In the present study, we investigated predictors of the ideal virtual team personality traits, extraversion, agreeableness, and conscientiousness, among business students at the University of Hawaii. Hawai’i, which became the 50th state in 1959, is geographically separated from the Continental United States by thousands of miles, and is largely dependent on tourism. Policymakers are seeking ways to broaden Hawaii’s economic base and improve employment prospects for its residents. Because of Hawaii’s remote location, it is of paramount importance for Hawaii workers to function productively in a virtual environment in order to participate in the global economy.

Since initial contact with Europeans in the 18th century, Hawaii’s population has been augmented by immigrants from other areas including China, Korea, Japan, Portugal, the Philippine Islands, and the United States, and there is no one majority racial or ethnic group [10]. While only 19.8% of Hawai’i residents claim descent from the original inhabitants of the Hawaiian islands [16], the Hawaiian culture is acknowledged as the host culture [33]. This culture holds distinct values, which have diffused and become part of the local culture in Hawaii, even among those without Hawaiian ancestry. These include family solidarity, industrious productivity, respect for and spiritual connection with the land, an appreciation for tradition, mindfulness of the effect of one’s actions upon the community, and respect for the natural environment [18, 31].

Compared to the culture of the Continental United States, Hawaiian culture is more group-oriented. This is not surprising; high individualism / low collectivism is characteristic of the culture of the Continental United States. In Hofstede’s classic study of dimensions of national culture, the United States ranked first in the world in level of individualism, with Australia a close second [25].
Individualism and collectivism are conceived as opposites on a single continuum. Those high in individualism conceive of the self as autonomous and independent, while those with a high level of collectivism define the self in relation to others. In general, individualists prioritize personal interests, and have a low level of concern for others. Collectivists prioritize group goals and sacrifice opportunities for personal gain to the good of the group [46, 47].

3. Hypotheses

We propose that the type of collectivism characteristic of Hawaiian culture is positively related to functioning productively in virtual teams.

H1: We propose collectivism positively predicts the Ideal Virtual Team Member personality, which we operationalize as the average of extraversion, agreeableness, and conscientiousness.

H2: We propose that group orientation has diffused with Hawaiian culture, and that identification with Hawaiian culture will therefore act as an indicator of suitability for group work, specifically virtual teams. Hawaiian Identity, the degree to which individuals identify with Hawaiian ethnic identity independent of ancestry, will predict the Ideal Virtual Team Member personality.

4. Methodology

4.1 Experimental Design

Participants in the study were college students enrolled in a business course at a small university in Hawaii. Participants were asked to complete a series of surveys designed to measure their level of extraversion, agreeableness, conscientiousness, and collectivism. Participants were also asked to identify their ethnic background.

4.2 Data Collection Instruments

A variety of measures have been used to measure the Big Five personality dimensions [14, 22, 29, 41, 45]. We selected a 44-item Likert-scale instrument to measure the Big Five personality dimensions [30], in order to balance validity with brevity. To assess collectivism, we used a previously validated measure of psychological collectivism [26]. The six-item Hawaiian Identity Scale is the extent to which individuals identified with Hawaiian ethnic identity, and is based on the Hawaiian Culture Scale (“HCS”) [24].

4.3 Scale Validation

The Big Five personality scale is comprised of five subscales: extraversion ($\alpha = .832$); agreeableness ($\alpha = .816$); neuroticism ($\alpha = .805$); openness to experience ($\alpha = .805$); and conscientiousness ($\alpha = .761$). A composite score for extraversion, agreeableness, and conscientiousness was calculated by averaging scores for these three traits. The Hawaiian Identity scale had $\alpha = .850$, while the collectivism measure [26] had $\alpha = .879$.

5. Results

Linear regression results indicate that the Ideal Virtual Team Member personality is significantly and independently predicted by collectivism and Hawaiian Identity. Age, sex and grade point average were not predictors.

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
</table>
|       | B | Std. Error | Beta | B | Std. Error |}
| 1 (Constant) | 2.110 | .693 | 3.044 | .003 |
| GPA | .078 | .128 | .072 | .610 | .544 |


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6. Discussion and Conclusions

Previous studies have linked trust with virtual team performance. At the same time, trust in virtual teams has been linked with extraversion, agreeableness, and conscientiousness. In this study, we examined the relationship among between collectivism, Hawaiian Identity, and personality characteristics that impact trust in virtual teams. Our results show that the higher an individual is in Collectivism and Hawaiian Identity, the more likely they will possess the personality dimensions that lead to better trust and performance in virtual teams.

Acknowledgement

We would like to thank Guy Kaulukukui for his insightful information about Hawaiian history, culture, and identity.

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Self-Underwritten IPOs: An Analysis of Underpricing and Market Liquidity

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Abstract

This study investigates a sample of self-underwritten IPOs - a new pricing and distribution mechanism for firms going public through an initial public offering that attracted 41 firms over 1996 to 2000. We focus our analysis on three important issues: initial underpricing, stock market performance over the first three months of trading, and market liquidity of self-underwritten IPOs as compared with the traditional investment banker-underwritten IPOs during the same period. Our main findings are as follows. First, self-underwritten IPOs are underpriced significantly less than the investment banker-underwritten (conventional) IPOs, despite the former’s smaller market capitalization and smaller offer size. Second, over the following 59 days of trading we find little difference in the mean and median stock returns between the self-underwritten and conventional IPOs. Finally, self-underwritten IPOs suffer from significantly higher bid-ask spread, lower trading frequency, lower trading volume and higher adverse selection component of the spread.

1. Introduction

We study a unique set of firms that choose to go public by self-underwriting their new issues (hereafter, SUIs), instead of employing the services of investment bankers. This is in sharp contrast to the typical method of going public by employing an investment banking syndicate that helps the firm sell shares to the public (hereafter, IUIs). The main question of interest is why do firms choose self-underwriting over traditional underwriting by an investment banker (IB)? There are perhaps multiple reasons why some firms decide to forgo the services offered by investment banks such as risk bearing, distribution of shares, advice and counsel. If there exist net benefits to self-underwriting, then we posit that this may become an increasingly popular trend in future years, even though we found only 41 firms doing so in the past from 1996-2000. As the financial market for IPOs continuously evolves over time, advancements in technology, information dissemination, and trading could be expected to yield more competitive and efficient pricing and distribution systems for firms wanting to tap into capital markets. This trend may be comparable to consumers bypassing realtors to escape paying steep commissions (see [24]), or shopping online to avoid retail margins, or going through internet based mortgage lenders to get more competitive rates and lower closing costs.

A firm may be too risky to persuade an IB to offer underwriting services. Or the firm may be less risky and confident of public demand for its shares. It may find the typical 7% underwriting fee too costly given the risk involved (from its private information-based perspective). Another motive may be that the firm uses a two-stage (or sequential) going public strategy: first make a small issue on its own to test waters (public demand for its shares) and follow it up with a larger secondary issue, self-underwritten or traditional. It may also be that the firm wants to control how the shares being sold are dispersed, either widely to retail investors or selectively to large investors, such as institutions and blockholders, so as to minimize price bargaining by institutions and control threats to founders’ hold on the firm. Yet another possibility is that self-underwriting is a ‘hot IPO market’ phenomenon so that the firm believes it needs little help in going public from an IB.

Let us look more closely at these motives for SUIs by drawing from the current literature on IUIs. First, by forgoing IB services, are SUI firms incurring the risk of low analyst coverage (fewer number of analysts following the SUI and fewer buy and larger sell recommendations for SUI) relative to IUI? Krigman, Shaw, and Womack [18] report survey evidence that analyst coverage is an important reason why issuers pay for underwriter services.

Second, do SUIs incur higher initial underpricing by trying to save on investment banking fees? Loughran and Ritter (LR) [24] report that during 1990-1998, 3025 companies going public in the U.S. left more than $27 billion on the table, where the money left on the table is the excess of the first day closing market price over the
offer price multiplied by the number of shares offered. The average underpricing, measured as the % difference between the first-day closing market price and the offer price, is 14% for their sample. This amounts to an average of $9.1 million per IPO and is twice as large as the average investment banker fees paid by the issuing firms. This suggests that sum of initial underpricing and gross IB fees are about 21% on average in their sample. It provides an estimate of the cost of going public to the issuers. They propose a prospect theory-based explanation for this apparently puzzling behavior. This theory assumes that entrepreneurs care more about the change in their wealth rather than the level of wealth. It predicts that in most IPOs the wealth loss from initial underpricing will be less than the gain on shares retained by the preissue shareholders from the jump in the market price of the IPO. While the average IPO leaves $9.1 million on the table over 1990-1998, most IPOs leave relatively little money on the table. For the subset of IPOs that leave money on the table through underpricing, the offer price and first-day market price are higher than had been originally anticipated by the preissue shareholders. Thus those leaving money on the table are simultaneously discovering that they are wealthier than they expected at the time of filing the offer price range. The loss of wealth from underpricing is lower than the unexpected gain in wealth resulting from their retained holdings. This net gain in wealth leaves the preissue shareholders happy. One wonders if SUIs expose themselves to greater underpricing risk by trying to save on the underwriting fees.

Chen and Ritter (CR) [6] find (a) evidence of clustering of IB gross spreads on IPOs at 7%, especially for moderate size IPOs with proceeds of $20 to 80 million (in dollars of 1997 purchasing power) (for this group more than 90% of IPOs over 1995 to 1998 had exactly 7% spread), (b) the concentration of 7% spreads has increased during the 1990s, (c) the average spread has remained virtually constant during the 1985 to 1998 period, in contrast to declining fees for auditing and mergers and acquisitions, and (d) spreads on U.S. IPOs is roughly twice as high as in other countries. This raises the question whether self underwriting is a competitive response by the issuers to the noncompetitive gross spread. Specifically, have the number of SUIs and their dollar proceeds increased over time? CR argue that underwriters do not compete on price and gross spreads for most deals above $30 million are above competitive levels (see figure 3 on p. 1113 in their paper). They observe that one reason for the high spread is to induce underwriters to do a credible job certifying the quality of an offering. Does this suggest that SUIs are likely to be more common in the moderate to large offer size range ($ 30 + million) where the IB fees are clustered and most non-competitive? Do SUI firms dispense with IB because they are so good they do not need IB certification, or because certification is not worth the cost/high spreads?

Hansen [12] tests two theories for the convergence of gross underwriting spread at a fixed rate of 7% across IPOs of different sizes and risk levels. The collusion (cartel) theory alleges that investment banks collude either explicitly or implicitly (as claimed by Chen and Ritter [6]), to profit from underwriting services. In contrast, the efficient contract theory asserts that the 7% contract is an efficient innovation that suits the initial pricing and marketing of IPOs. Hansen finds that the IPO market is unconcentrated, entry into the market has been strong, and 7% spread does not contain abnormal profits relative to non-7% IPOs. He concludes his tests do not reveal evidence of collusion. Thus, his findings cast doubt on the non-competitive underwriter gross spreads being a motive for SUIs.

Another question of interest is the partial adjustment of offer price to market-wide information. For IUI, LR [24] (as well as many others) report that market returns (MR) over three weeks prior to the offer date are able to predict the first day returns (IR) - if the prior MR is lower the IR is lower and if the MR is higher so is the IR. This means that underwriters do not fully adjust the offer price with respect to public information. “Following market rises, issuers leave more than twice as much money on the table as following market declines ($12.7 million versus $5.6 million),” (see Table 3 on page 426 in their paper). LR offer a prospect theory explanation for the partial adjustment phenomenon – why underwriters do not fully adjust the offer price to information about the state of demand. Underwriters, as agents of issuers, may be less willing to adjust the offer price to public information, especially if the prior MR increases. This hesitancy increases IR and thereby increases the indirect compensation for underwriters, (see p. 424 in their paper). They argue that issuers acquiesce in partial adjustment because “Investment bankers can selectively underprice some IPOs by combining the bad news that there has been excessive dilution with the good news that they are wealthier than expected,” (p. 429), “…issuers let down their guard when there is good news and do not bargain aggressively for a higher offer price, whether this is due to public info or not,” (p. 430). Their empirical analysis shows that only one-third of the public information about market returns during the book-building period is incorporated into the offer price, p.436. Thus partial adjustment of offer price to market-wide movements is a moral hazard problem that conventional IPO issuers (IUI) face. We ask the question: do SUIs exhibit similar partial price adjustment phenomenon? We should expect this partial adjustment problem to be less severe for SUIs than IUIs.
Lowry and Schwert [25] examine the underwriters’ treatment of public information through the IPO pricing process. Using a sample of IPOs from 1985 to 1999, they find that public information is not fully incorporated into the initial price range as well as the final offer price. They find much more of a downward adjustment in offer price following market declines than upward following market increases, similar to LR [24]. When the market drops over the 15 trading days prior to the offer date, the issuers bear a reduction in the proceeds as offer price is adjusted downwards. But when the market goes up during the road show period, initial investors reap a windfall because of the partial upward adjustment of offer price. However, this omission is not sufficient to allow for profitable trading opportunities. This leads them to conclude that vast majority of public information is in fact incorporated and the IPO pricing process is almost efficient. We plan to examine if SUIs adjust the offer price more efficiently in response to market-wide movements in the pressure period than do IUIs. How many SUIs are priced (i.e., have offer prices) below, within, and outside the file price range? How are the number of shares offered revised from the initial filing to the final offer in response to market movements?

Another question of interest is the split between primary and secondary shares in an SUI. Models of LR [24] and Habib and Ljungqvist (HL) [9] predict that IPOs selling a larger percentage of the firm, and with more secondary shares, should have less underpricing. HL present supporting empirical evidence. We will examine the relation between underpricing and the composition of the SUI offer size - primary (i.e., new shares) and shares issued by the insiders (secondary shares), and compare this with those of IUIs.

By choosing self-underwriting, a firm forgoes the security distribution services offered by underwriters. Making a reasonable assumption that this puts the SUI firm at a disadvantage in distribution of shares, we ask if SUIs are distributed primarily to retail or institutional investors? Is there a significant difference in the individual-institutional ownership structure of SUIs relative to IUIs?

Finally, our investigation turns to market quality. LR [24] report that 16% of IPOs in their sample close the first day at the offer price, which is widely attributed to underwriter price stabilization. Do SUIs exhibit (a) lower market liquidity; and (b) more short-run price volatility, because there is no underwriter price stabilization? Further, conventional underwriting is coupled with lockup period expiration effects (LPE), and SUIs are free from LPE. We plan to compare the abnormal return and market liquidity (bid-ask spread, trading volume, etc.) evidence on SUIs and IUIs at the lockup period expiration for IUIs.

We examine a sample of 41 self-underwritten IPOs (of which 21 are taken from the NYSE and the rest from the Nasdaq market) and 968 IPOs (141 NYSE and 827 Nasdaq) underwritten by investment bankers over the 1996 – 2000 period. The self-underwritten IPOs raised over 15 billion dollars as compared with over 171 billion dollars raised by investment banker-underwritten IPOs over this five-year window. Our main findings are as follows. First, self-underwritten IPOs are underpriced significantly less than the investment banker-underwritten (conventional) IPOs, despite the former’s smaller market capitalization and smaller offer size. Second, over the following 59 days of trading we find little difference in the mean and median stock returns between the self-underwritten and conventional IPOs. Finally, self-underwritten IPOs suffer from significantly higher bid-ask spread, lower trading frequency, lower trading volume and higher adverse selection component of the spread.

2. Main Research Questions

In this preliminary draft, we focus our analysis of SUIs on their initial underpricing and the quality of their immediate aftermarket liquidity. Previous IPO research has primarily focused on underpricing and the long run performance of IPOs. For example, Ibbotson [15], Ibbotson and Jaffe [16], Ritter [27] and others document that U.S. IPOs experience underpricing of approximately 15%, but that the amount of underpricing varies substantially over time and across industries. Furthermore, studies examining the long-run performance of IPOs ([11] [15] [23] [27] [32]) find evidence of negative stock price performance. Jain and Kini [17] document significant declines in operating performance during the three years following the IPO (relative to an industry-matched sample of seasoned firms). Moreover, Loughran, Ritter, and Rydqvist [22] summarize studies of IPOs in several countries other than the U.S. where a similar phenomenon is generally observed.

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Extant theoretical and empirical studies point out that investment bankers play an important role in the going-public process. In Booth and Smith [3], underwriters stake their reputation to certify that insiders fully disclose their private information regarding the value of the new issue to the market. Benveniste and Spindt [2] model the premarket as an auction in which the underwriter chooses the offer price and allotment schedule to induce their regular clients to disclose their private information. Since investors have an incentive to withhold positive private information to maximize their gains, Benveniste and Spindt [2] show that IPOs have to be underpriced to compensate them for revealing positive information. Consistent with these predictions, empirical investigations by Carter and Manaster [5], Carter, Dark, and Singh [4], and Michaely and Shaw [26] find that IPOs managed by more prestigious underwriters are associated with less initial underpricing. Moreover, they report that the widely documented long-run underperformance is less severe for IPOs handled by more prestigious underwriters.

If issuers in SUIs acquire private info about demand for IPOs in a similar fashion, then we should expect SUIs to be underpriced because this conditional underpricing is the result of an incentive compatibility constraint. But there should be full adjustment to public info with SUIs because there is no underwriter moral hazard problem.

Evidence on the microstructure characteristics following an IPO is sparse. The lead underwriter and other syndicate members continue to serve as major market-makers in their new issues in the over-the-counter (OTC) market. For IPOs on the New York Stock Exchange, the underwriters facilitate market making by placing limit orders and acting as floor brokers. Using daily data, Hegde and Miller [13] study IPOs during 1983-84 and report that quoted percentage spreads for IPOs are on average three-fourths as large as those for seasoned stocks. They find significant differences in both the determinants of spreads (e.g. price level and trading volume) and in elasticities across samples. Hanley [10] and Rudd [29] study the effects of price stabilization by underwriters. Hanley finds that the daily closing bid-ask spreads are smaller for issues hypothesized to be most affected by underwriter price support during the first ten days of trading.

Investment bankers can affect the secondary market trading in new issues for several reasons. First, Carter and Manaster [5] argue that prestigious underwriters screen new issues and select the less risky firms using non-public information. The low risk of these new issues may attract fewer informed traders in the secondary market. Second, the new issues brought out by prestigious investment bankers tend to be larger in firm size, and may be characterized by more analyst following. The larger rate of flow of public information that accompanies a wider group of analysts lowers the marginal return on information gathering. Third, if prestigious investment bankers succeed in attracting more uninformed investors in the secondary market, the cost of informed trading would be spread over a larger number of liquidity traders [7]. Finally, if, as in Benveniste and Spindt [2] model, underwriters have induced their regular clients to reveal their positive private information in the premarket, the investment bankers begin market making in the secondary market with less information disadvantage. These arguments suggest that uninformed investors in the primary and secondary markets expect less adverse selection risk the higher the reputation of the underwriter of the IPO.

We focus our analysis on the following three questions: (1) Do SUIs suffer greater initial underpricing relative to IUIs? (2) How do the stock returns on SUIs compare with those on IUIs in the immediate aftermarket? (3) Do SUIs suffer from poorer aftermarket liquidity relative to IUIs?

3. Data and Measurement

We select a sample of firms that went public with, and without, the intermediation of an underwriter on the New York Stock Exchange (NYSE) and Nasdaq between 1996 and 2000. We retain all IPOs that have complete intraday transactions data over the first 60 days of trading in the files provided by the Trades and Quotes (TAQ) database. Our final sample comprises 41 self-underwritten IPOs (of which 21 are taken from the NYSE and the rest from the Nasdaq market) that do not employ the services of investment bankers, and 968 IPOs (141 NYSE and 827 Nasdaq) underwritten by investment bankers over the 1996 – 2000 period. We obtain IPO details such as the IPO price, date, number of shares offered, and offer proceeds for the 41 self-underwritten firms from Edgar, and for the 968 firms underwritten by investment bankers from Securities Data Corporation (now a unit of Thomson Financial).
All trades during the sample period, except opening transactions on each day, are used in our analysis. We follow Lee and Ready [20] in adjusting for the time lag in reporting trades and identify the prevailing quotes for each transaction as those that are in effect five seconds earlier. Returns data, closing prices, SIC codes, as well as market capitalization on the first trading day were obtained from the Center for Research in Security Prices (CRSP) daily files.

Several proxies for underwriter prestige have been used in the IPO literature. Evaluating the effects of three different measures of underwriter reputation on initial underpricing and long-run performance of IPOs, Carter, Dark, and Singh [4] conclude that the Carter and Manaster [5] ranking of investment banks is the most significant. This ranking method compiles, on a scale of zero (low reputation) to nine (high reputation), underwriters’ relative placements in IPO tombstone announcements from 1985 through 1991. We use the rankings developed by Carter, Dark, and Singh [4] to assess the role of underwriter reputation in shaping market liquidity.

Initial underpricing is measured as the percentage difference between the first-day closing market price and the offer price of a new issue. Because liquidity is more difficult to measure, we use several measures of trading costs and trading activity. Our primary measure of adverse selection cost is based on the quote revision model of Huang and Stoll [14], Lin, Sanger, and Booth (LSB) [21], and Stoll [31]. Following LSB, we estimate the adverse selection cost component, $\lambda$, of one-half the effective spread, $Z$, as follows:

$$Q_{t+1} = Q_t + \lambda Z_t + \epsilon_{t+1},$$

where

$$Q_t = (A_t + B_t) / 2$$

$B_t, A_t =$ bid and ask price quotes at time t

$$Z_t = P_t - Q_t$$

$P_t =$ transaction price at t

$\epsilon_{t+1} =$ the disturbance term.

As in LSB [21], the $\lambda$ and effective spread estimates are based on the logarithms of $Q_t$ and $P_t$. This transformation produces continuously compounded rates of change in the quote midpoints and transaction prices, which facilitates cross-sectional comparisons. The effective relative spread is computed as twice the absolute value of the logarithm of the ratio of transaction price to quote midpoint. In this model, $\lambda (0 < \lambda < 1)$ measures the dealer’s quote revision in response to a trade as a fraction of half the signed effective spread $Z_t$. We also use the relative quoted spread, defined as the dollar quoted spread divided by the quote midpoint $Q_t$, and the relative effective spread, measured as twice the absolute value of $Z_t$, as alternative measures of liquidity costs.

We present several measures of trading costs and market depth. These estimates are first averaged across all trades over each day for a given firm, then averaged across all trading days for each firm, and finally averaged across all sample firms. The mean relative quoted spread is defined as the dollar quoted spread divided by the quote midpoint, while the mean relative effective spread is equal to $2 \log (P_t/Q_t))$.

Lee, Mucklow, and Ready [19] show that market makers adjust not only their bid and ask quotes, but also the number of shares they are willing to trade at those quotes (quoted depth) in response to a trade. In our sample, the mean quoted depth is equal to depth at the bid plus depth at the ask. Since a wide quoted spread indicates lower market liquidity, but a large quoted depth implies greater market liquidity, we construct ratios of trading costs to the quoted depth to obtain a summary measure of liquidity. The mean relative quoted and effective spreads per unit of depth are constructed by dividing the relative quoted spread and the relative effective spread respectively by total depth.

We have relied on the Lin, Sanger, and Booth [21] estimate of the adverse selection component of the bid-ask spread. This model focuses on quote revisions in response to a trade in estimating the spread components, but it does not directly take into account the transaction price response to signed order flow. Glosten and Harris [8] develop an alternative model of measuring adverse selection cost in terms of the response of transaction price to signed order flow:

2 We exclude daily opening transactions from the analysis because they take place in a call market environment, whereas the rest of trades are generally conducted in a continuous auction market.
\[ \Delta p_t = \lambda q_t \cdot P[ D_t = D_{t-1} ] + y_t, \]  
\hspace{1cm} (2)

where \( \Delta p \) is the change in transaction price, \( q \) is the signed trade size, \( D \) is a dummy variable that is equal to +1(-1) for a trade classified as a buy (sell), and \( y \) is an error term. To scrutinize the robustness of the previous results based on the LSB estimate of adverse selection costs, we estimate the Glosten and Harris \( \lambda \), \( \lambda_GH \). Our revised estimate of adverse section costs are qualitatively similar to those based on the LSB estimate of \( \lambda \).

4. Empirical Results

Table 1 presents descriptive statistics on the 41 self underwritten IPOs. We measure underpricing (also called the initial return) as the percentage difference between the first trading day closing market price and the offer price. From Panel A the majority of SUIs are taken from the manufacturing industry, and 6 of the remaining come from finance, insurance and real estate. SUIs in the manufacturing industry have the highest mean underpricing of 20% followed by a mean of 17% for their counterparts in the finance, insurance and real estate sectors. From Panel B, our sample is concentrated in two calendar years, 1997 and 1998. The average underpricing is at its highest level of 18% in 1999, which saw the hottest IPO market in our sample period. The next largest mean underpricing was in 1996 at 14%.

<table>
<thead>
<tr>
<th>TABLE 1. DESCRIPTIVE STATISTICS ON THE SELF-UNDERWRITTEN IPOS</th>
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<tbody>
<tr>
<td>The self underwritten sample includes 41 firms that went public through an initial public offering on NYSE or NASDAQ between 1996 and 2000. Of the 41 firms, 21 went public on the NYSE.</td>
</tr>
<tr>
<td>Panel A: Number of SUIs and their underpricing by industry:</td>
</tr>
<tr>
<td>Manufacturing: 17: 20.32%</td>
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<tr>
<td>Transport/electric/gas/sanitary services: 1: 16.26%</td>
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<tr>
<td>Retail Trade: 3: -6.67%</td>
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<tr>
<td>Finance/Insurance/Real Estate: 6: 17.24%</td>
</tr>
<tr>
<td>Services: 14: 4.66%</td>
</tr>
<tr>
<td>Panel B Number of SUIs and their underpricing by Calendar Year:</td>
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<tr>
<td>1996: 3: 14.20%</td>
</tr>
<tr>
<td>1997: 3: 1.73%</td>
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<tr>
<td>1998: 16: 12.14%</td>
</tr>
<tr>
<td>1999: 14: 18.49%</td>
</tr>
<tr>
<td>2000: 5: 2.11%</td>
</tr>
</tbody>
</table>

In Table 2 we compare the SUIs with the contemporaneous IUIs on the two exchanges. From column 2, the NYSE SUIs have a median market capitalization (as of the first trading day closing price) of $390 million as compared with $785 million for IUIs. On the Nasdaq, the median SUI has a market cap of $141 million versus $420 million for the median IUI. These results show that SUIs are considerabily smaller in firm size that their IUI counterparts. From column 3, the median gross IPO proceeds for the NYSE SUIs and IUIs are, respectively, $345 and 191 millions. The corresponding figures for the Nasdaq market are $48 and 67 millions. The last column shows that the median IPO price ranges from $10 to $18.

<table>
<thead>
<tr>
<th>TABLE 2. SUMMARY MEASURE FOR SELF UNDERWRITTEN IPOS AND FOR THE UNIVERSE OF ALL OTHER IPOS</th>
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<tbody>
<tr>
<td>The self underwritten sample includes 41 firms that went public through an initial public offering on NYSE or NASDAQ between 1996 and 2000. Of the 41 firms, 21 went public on the NYSE. There were 141 other firms that went public on the NYSE using investment bankers (conventional IPOs), and 827 conventional IPOs on Nasdaq. The values represent means followed by standard deviations in parentheses, and then by the median.</td>
</tr>
<tr>
<td>FIRST DAY MARKET CAPITALIZATION</td>
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</table>
Table 3 presents univariate test results on (a) initial underpricing (initial return), (b) aftermarket stock returns up to 60 trading days (roughly three calendar months), and (c) stock return volatility in the aftermarket. From column 2, the average (median) underpricing for the NYSE SUIs is 2.29% (0.96%), which is significantly lower (at the 1 percent level) than the mean (median) of 13.98% (10.00%) for their IUI counterparts (based on a t-test). Similarly, the Nasdaq SUIs have a mean (median) initial return of 13.86% (16.25%), which is significantly below the average (median) of 63.98% (29.43%). When we merge the NYSE and Nasdaq samples, the mean (median) initial returns for SUIs is 7.76% (7.78%), which is significantly less than the average (median) return of 56.70% (24.74%) for the IUIs. Thus, self-underwritten IPOs are underpriced significantly less than the investment banker-underwritten IPOs, despite the formers’ smaller market capitalization and smaller offer size.

From the last column and the last row (i.e., the last cell), the mean (median) holding period return over the following 59 trading days for the SUIs is 1.10% (-6.41%) as compared with 6.53% (-7.67%) for the IUIs. The results over shorter time windows show similar patterns. Thus, we find no significant difference in aftermarket stock returns between SUIs and IUIs in the first three months of trading.

The remaining three tables present estimates concerning the market liquidity of IPOs. By doing away with underwriters, SUIs lose the support of a dedicated investment banker in nurturing a public market in their new issues. This raises questions as to whether SUIs suffer from less liquid markets relative to IUIs. To address this question we present results on quoted dollar spread, relative quoted spread (%), trade size (number of shares traded), daily number of trades, daily share volume of trading, quoted depth (number of shares), effective spread ($), relative effective spread (%), relative quoted spread divided by depth, relative effective spread divided by depth, and two estimates of the adverse information component (%) using the LSB and GH models.

Table 3. Univariate Analysis of Stock Returns for Self Underwritten IPOs and for the Universe of All Other IPOs

The self underwritten sample includes 41 firms that went public through an initial public offering on NYSE or NASDAQ between 1996 and 2000. Of the 41 firms, 21 went public on the NYSE. There were 141 other firms that went public on the NYSE using investment bankers (conventional IPOs), and 827 conventional IPOs on Nasdaq. The values represent means followed by standard deviations in parentheses, and then by the median. *** denotes significantly different at 1%, ** at 5%, and * at 10% based on t-test for difference between samples.

<table>
<thead>
<tr>
<th></th>
<th>DAY 1 INITIAL</th>
<th>DAYS 2-5</th>
<th>DAYS 6-60</th>
<th>DAYS 2-60 RETURN</th>
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<tr>
<td>Self-Underwritten (NYSE)</td>
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<td>(MILLIONS)</td>
<td>(MILLIONS)</td>
<td>(MILLIONS)</td>
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<tr>
<td>1,522.6</td>
<td>577.5</td>
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<tr>
<td>(2,757.5)</td>
<td>(654.9)</td>
<td>(14.6)</td>
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<tr>
<td>389.5</td>
<td>345.1</td>
<td>17.1</td>
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<tr>
<td>(2,757.5)</td>
<td>(1,375.8)</td>
<td>(9.7)</td>
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<td>389.5</td>
<td>190.5</td>
<td>18.0</td>
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<tr>
<td>Conventional (NYSE)</td>
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<td>(3,587.4)</td>
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<td>784.5</td>
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<td>Self-Underwritten (Nasdaq)</td>
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<tr>
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<td>141.4</td>
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<td>419.8</td>
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<td>Self Underwritten (Total Sample)</td>
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<tr>
<td>937.2</td>
<td>285.5</td>
<td>17.25</td>
<td></td>
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<td>(2,088.1)</td>
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<td>342.1</td>
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<td>Conventional (Total Sample)</td>
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<td>454.8</td>
<td>73.0</td>
<td>15.0</td>
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</table>
From Table 3, the NYSE SUIs have a mean quoted spread per share of 17 cents, which is significantly larger than the mean of 14 cents for the conventional IPOs over the first 60 trading days. Other spread measures support this finding that trading costs for SUIs are significantly higher than those for IUIs. For instance, the mean relative effective spread over the first three months of trading for SUIs and IUIs, respectively, are 0.81% and 0.49%, and the difference is highly significant. The lower effective spread compared to the quoted spread indicates that a number of trades are executed inside the quotes. Similarly, the average daily number of trades is lower for SUIs. The average number of shares traded is significantly lower for SUIs over the first 20 days of trading, but this difference turns insignificant over the entire 60 day period. The mean quoted depth (equal to depth at the bid plus depth at the ask, in number of shares) is also lower for SUIs, but only over the first 10 days. These results show that the NYSE SUIs have lower market liquidity over the first 60 days of trading as compared with their IUI peers.

The last two rows of Table 3 present estimates on the adverse selection component of the spread. The models of Benveniste and Spindt [2] and others argue that underwriters certify the quality of IPOs and mitigate information asymmetry between informed and uninformed investors. These models imply that a firm that chooses to reject investment banker intermediation at the IPO stage would expose investors to greater adverse selection risk in the aftermarket trading. Consistent with this implication, we find that the mean adverse section component of the spread based on the LSB model for the NYSE SUIs is 54% on the first day of trading, as compared with 23% for the IUIs. The difference is significant at the 1 percent level. The estimates based on the GH model (see the last row) support this finding. The remaining results show that the NYSE SUIs have significantly greater adverse selection component of the spread over the first 20 days of trading, but not beyond. Thus our estimates show the NYSE SUIs have greater bid-ask spreads in the aftermarket due primarily to larger adverse selection risk.
The self underwritten sample includes 41 firms that went public through an initial public offering on NYSE or NASDAQ between 1996 and 2000. Of the 41 firms, 21 went public on the NYSE. There were 141 other firms that went public on the NYSE using investment bankers (conventional IPOs), and 827 conventional IPOs on Nasdaq. The values represent means followed by standard deviations in parentheses, and then by the median. *** denotes significantly different at 1%, ** at 5%, and * at 10% based on t-test for difference between samples.

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<tr>
<th>SELF UNDERWRITTEN IPOs</th>
<th>DAY 1</th>
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<th>DAYS 1-20</th>
<th>DAYS 1-60</th>
</tr>
</thead>
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<td><strong>Average Share Price ($)</strong></td>
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<tr>
<td>CONVENTIONAL IPOs</td>
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<td>(14.90)</td>
<td>(15.40)</td>
<td>(15.50)</td>
<td>(15.21)</td>
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<td></td>
<td>16.53</td>
<td>15.76</td>
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<tr>
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<td>20.29</td>
<td>19.99</td>
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<td>19.71</td>
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<td><strong>Quoted Dollar Spread ($)</strong></td>
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</tr>
<tr>
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<td>0.17</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
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<td>(0.03)</td>
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<td>0.18</td>
<td>0.18</td>
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<tr>
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<td>(0.11***)</td>
<td>(0.13***)</td>
<td>(0.14***)</td>
<td>(0.14***)</td>
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<td>1.18</td>
<td>1.18</td>
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<td>0.98</td>
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<td>(0.53***)</td>
<td>(0.64***)</td>
<td>(0.70***)</td>
<td>(0.80***)</td>
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<td>0.29</td>
<td>0.34</td>
<td>0.35</td>
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<td>(1.741)</td>
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<td>(1.466)</td>
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<td>2.578</td>
<td>2.676</td>
<td>2.461</td>
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<td>(5,680***)</td>
<td>(3,713)</td>
<td>(3,268)</td>
<td>(2,653)</td>
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<td>(3,734)</td>
<td>(1,938)</td>
<td>(1,705)</td>
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<td><strong>Daily Number of Trades</strong></td>
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<tr>
<td></td>
<td>183</td>
<td>149</td>
<td>133</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>(197)</td>
<td>(148)</td>
<td>(132)</td>
<td>(113)</td>
</tr>
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<td></td>
<td>132</td>
<td>93</td>
<td>87</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>(1,182***)</td>
<td>(393***)</td>
<td>(284**)</td>
<td>(185*)</td>
</tr>
<tr>
<td></td>
<td>(872)</td>
<td>(425)</td>
<td>(301)</td>
<td>(198)</td>
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<td>190</td>
<td>112</td>
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<td>(720,211)</td>
<td>(638,113)</td>
<td>(428,372)</td>
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<td>340,300</td>
<td>278,390</td>
<td>214,375</td>
<td>151,168</td>
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<td>(7,689,257***)</td>
<td>(1,608,664**)</td>
<td>(1,035,967*)</td>
<td>(541,856)</td>
</tr>
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<td>(785,646)</td>
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<td>237,232</td>
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<td>14,906</td>
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<td>(13,603)</td>
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<td>(43,052***)</td>
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<td>28,577</td>
<td>15,853</td>
<td>12,508</td>
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### Table 5. Univariate Analysis of Liquidity Variables for Self Underwritten IPOs

The self underwritten sample includes 41 firms that went public through an initial public offering on NYSE or NASDAQ between 1996 and 2000. Of the 41 firms, 21 went public on the NYSE. There were 141 other firms that went public on the NYSE using investment bankers (conventional IPOs), and 827 conventional IPOs on Nasdaq. The values represent means followed by standard deviations in parentheses, and then by the median. *** denotes significantly different at 1%, ** at 5%, and * at 10% based on t-test for difference between samples.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Day 1</th>
<th>Days 1-10</th>
<th>Days 1-20</th>
<th>Days 1-60</th>
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<tr>
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<td>0.07***</td>
<td>0.08***</td>
<td>0.08***</td>
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<td>(0.03)</td>
<td>(0.03)</td>
<td>(0.04)</td>
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<tr>
<td><strong>Relative Effective Spread (%)</strong></td>
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<td>0.77</td>
<td>0.76</td>
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<td>(0.71)</td>
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<td>0.57</td>
<td>0.63</td>
<td>0.64</td>
<td>0.63</td>
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<td></td>
<td>0.35***</td>
<td>0.40***</td>
<td>0.43***</td>
<td>0.49***</td>
</tr>
<tr>
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<td>(0.16)</td>
<td>(0.20)</td>
<td>(0.20)</td>
<td>(0.23)</td>
</tr>
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<td><strong>Relative Quoted Spread/Depth*1,000,000</strong></td>
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<td>1.53</td>
<td>1.56</td>
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<td>1.16</td>
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<td>0.66***</td>
<td>1.00***</td>
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<td>(0.60)</td>
<td>(0.65)</td>
<td>(0.74)</td>
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<td><strong>Relative Effective Spread/Depth*1,000,000</strong></td>
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<td>1.01</td>
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<td>(1.35)</td>
<td>(1.36)</td>
<td>(2.43)</td>
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<td>0.73</td>
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<td>0.19***</td>
<td>0.33***</td>
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<td>(0.39)</td>
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<td><strong>Adverse Information Component (LSB) %</strong></td>
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<td>44.73</td>
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<td>22.70***</td>
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<td>33.84***</td>
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<td>(10.23)</td>
<td>(9.72)</td>
<td>(9.31)</td>
<td>(11.50)</td>
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<td><strong>Adverse Information Component (GH) %</strong></td>
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<td>43.66</td>
<td>41.63</td>
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<td>(20.28)</td>
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<td>45.29</td>
<td>44.72</td>
<td>43.77</td>
<td>46.34</td>
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<td></td>
<td>20.37***</td>
<td>27.14***</td>
<td>30.47***</td>
<td>37.47</td>
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<tr>
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<td>(10.56)</td>
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<td>20.15</td>
<td>28.01</td>
<td>31.43</td>
<td>37.31</td>
</tr>
</tbody>
</table>

The self underwritten sample includes 41 firms that went public through an initial public offering on NYSE or NASDAQ between 1996 and 2000. Of the 41 firms, 21 went public on the NYSE. There were 141 other firms that went public on the NYSE using investment bankers (conventional IPOs), and 827 conventional IPOs on Nasdaq. The values represent means followed by standard deviations in parentheses, and then by the median. *** denotes significantly different at 1%, ** at 5%, and * at 10% based on t-test for difference between samples.
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<th>19.88</th>
<th>20.59</th>
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<td></td>
<td></td>
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</tr>
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<td>0.40</td>
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<td>0.27</td>
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<tr>
<td></td>
<td>(0.31)</td>
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Table 5 reports the market microstructure results for the Nasdaq IPOs. As with the NYSE IPOs, we find that the Nasdaq SUIs have significantly higher bid-ask spreads, lower trading frequency (daily number of trades), lower trading volume, and higher adverse selection component of the spread relative to their counterparts. Unlike the NYSE sample, the differences in many measures of liquidity persist over the entire 60 trading day period. The estimates in Table 6 confirm that the combined sample of SUIs from both NYSE and Nasdaq has significantly lower aftermarket liquidity due primarily to the larger adverse selection component of the spread.

### Table 6. Univariate Analysis of Liquidity Variables for Self Underwritten IPOs

**COMBINED SAMPLE**

The self underwritten sample includes 41 firms that went public through an initial public offering on NYSE or NASDAQ between 1996 and 2000. Of the 41 firms, 21 went public on the NYSE. There were 141 other firms that went public on the NYSE using investment bankers (conventional IPOs), and 827 conventional IPOs on Nasdaq. The values represent means followed by standard deviations in parentheses, and then by the median. *** denotes significantly different at 1%, ** at 5%, and * at 10% based on t-test for difference between samples.

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<th>Table 6. Univariate Analysis of Liquidity Variables for Self Underwritten IPOs</th>
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<td>The self underwritten sample includes 41 firms that went public through an initial public offering on NYSE or NASDAQ between 1996 and 2000. Of the 41 firms, 21 went public on the NYSE. There were 141 other firms that went public on the NYSE using investment bankers (conventional IPOs), and 827 conventional IPOs on Nasdaq. The values represent means followed by standard deviations in parentheses, and then by the median. *** denotes significantly different at 1%, ** at 5%, and * at 10% based on t-test for difference between samples.</td>
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5. Concluding Remarks

This study investigates a sample of self-underwritten IPOs - a new pricing and distribution mechanism for firms going public through an initial public offering that attracted 41 firms over 1996 to 2000. We focus our analysis on three important issues: initial underpricing, stock market performance over the first three months of trading, and market liquidity of self-underwritten IPOs as compared with the traditional investment banker-underwritten IPOs. Our main findings are as follows. First, self-underwritten IPOs are underpriced significantly less than the investment banker-underwritten (conventional) IPOs, despite the former's smaller market capitalization and smaller offer size. Second, over the following 59 days of trading we find little difference in the mean and median stock returns between the self-underwritten and conventional IPOs. Finally, self-underwritten IPOs suffer from significantly higher bid-ask spread, lower trading frequency, lower trading volume and higher adverse selection component of the spread. These findings show that going public firms that choose to underwrite their own offerings tradeoff higher aftermarket liquidity costs for lower initial underpricing. In addition, these firms save on the approximately 7% gross underwriting fee; the net saving will be lower because self-underwritten IPO firms have to bear the expenses associated with pricing and distribution of the new issue.

The main question of interest is why do firms choose self-underwriting over traditional underwriting by an investment banker (IB)? There are perhaps multiple reasons why some firms decide to forgo the services offered by investment banks such as risk bearing, distribution of shares, advice and counsel. If there exist net benefits to self-underwriting, then we posit that this may become an increasingly popular trend in future years, even though we found only 41 firms doing so in the past from 1996-2000. As the financial market for IPOs continuously evolves over time, advancements in technology, information dissemination, and trading could be expected to yield more competitive and efficient pricing and distribution systems for firms wanting to tap into capital markets. This trend may be comparable to consumers bypassing realtors to escape paying steep commissions (see [24]), or shopping online to avoid retail margins, or going through internet based mortgage lenders to get more competitive rates and lowering closing costs.

The next immediate step for this paper is to complement the univariate tests presented in this draft by conducting multivariate tests to control for firm-specific factors. These tests would allow us to establish whether the lower initial underpricing and poorer aftermarket liquidity are indeed different for firms that self-underwrite their IPOs as compared to traditional IPOs that employ investment bankers. In addition, we plan to take up the other questions regarding self-underwritten IPOs that we discussed in the first section of this draft.

References


Understanding the Gap between Website Value and Consumer Shopping Orientation: An Application of Task-Technology Fit Theory to Online Shopping Values

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Abstract

Value judgments, such as functional, emotional, utilitarian, and hedonic values have received considerable attention in recent years. However, research on these interrelationships has been somewhat limited in online shopping, particularly in regards to the gap between website values versus consumer shopping orientations. The purpose of this research is to propose and empirically test a conceptual framework that incorporates the interrelationships of website values, shopping satisfaction, and repurchase intention into framework and validate them in a B2C online shopping context. Specifically, we examine the moderating role of consumer shopping orientations in the impact of website values on shopping satisfaction.

Our results suggest that the impact of website values on shopping satisfaction is negatively moderated by consumer shopping orientations. Therefore, functional and emotional values are probably necessary but are an insufficient precondition for cultivating shopping satisfaction. Moreover, consumer hedonic orientation plays a slightly higher influence on shopping satisfaction than utilitarian orientation. Understanding these factors can provide direction for planning website features as well as consumer desired values that will increase shopping satisfaction and repurchase intention.

Keywords: Value judgment, satisfaction, repurchases intention, moderating effect

1. Introduction

It goes without saying that patronage has a critical impact on company’s survivability and is considered an important source of revenue by most companies. The question is why not all customers are loyal. To response to this question, many studies ([7][14][39]) switch its focus to the antecedents of purchase behavior. Potential determinants include: service quality, customer satisfaction, purchase intention, and customer value. While prior studies have focused on these antecedents in physical contexts, they are important in virtual contexts as well. Venkatesh and Agarwal [42] argued that usability of the website could predict consumer purchase behavior. Mathwick et al. [32] even asserted that service quality will have a direct and positive effect upon intention and usage for online shopping. Yoon [49] suggested that consumers with satisfied website experiences were more likely to form their positive intention—that is, online purchase intention should increase after website satisfaction passes a certain threshold.

Although these concepts have received considerable attention in recent years, research on these interrelationships has been somewhat limited in online shopping, particularly in regards to the gap between website values (evaluated after purchase) versus consumer shopping orientations or personal shopping preference (evaluated inherently to purchase). Song and Zahedi [38] argued that effective website design plays an important role in maintaining long-term consumer relationship, however, what are online consumers really desire could be underestimated if we put too much attention on web-design elements. Moreover, Cowles et al. [15] recommended that business to customer (B2C) studies have better to consider not only the website value but also the shopping orientation behind consumer use of the medium. This is because consumers will go back to retailers only when they received their desired values [48] and e-marketers should deliver a value proposition that is most concerning for online consumers [33].

Task-Technology Fit (TTF) theory is deemed most relevant for the theoretical foundation of the proposed model. The rationales for applying TTF to online shopping context are three folds: (1) According to the definition of TTF,
an information technology will have a positive impact on user performance if it provides a good fit with the task it supports [24]. Similarly, online shopping activities may be related to how well the consumer feels website values fit their shopping tasks. (2) In contrast to job-oriented workers in an organizational setting, shopping tasks performed by consumers vary from broad information searching to specific commercial transactions [28]. For example, shopping tasks can be directed by consumer’s goal-directed or experiential shopping orientations [47]. (3) Since TTF evaluations are very context-specific [23], it is necessary to apply the TTF concept to a specific task domain (e.g. online shopping). Given the use of TTF as theoretical foundation, it is reasonable to expect that understanding how consumers interact with the website will be a key prerequisite for practitioners competing with competitors.

Overall, the purpose of this research is to propose and empirically test a conceptual framework that incorporates the interrelationships of website values, shopping satisfaction, and repurchase intention into framework and validate them in a B2C online shopping context. Specifically, we examine the moderating role of consumer shopping orientations in the impact of website values on shopping activities. We suspect that consumer shopping orientations are likely to serve as a moderator of the influence of website values upon shopping satisfaction. That is, the form of relationship between them may not be linear. Understanding these overlooked issues from past research to the present study could help e-marketers assess how well the two-way value fits each other.

The remaining sections are organized as follows. First, we review the relevant literature and discuss our research method, including data collection and measurement. We then present our results and draw conclusions from the data. Finally, we discuss some managerial implications of this work and suggest future directions for both academia and industry.

2. Theory and Proposed Model

2.1 The differences between website values and shopping orientations

Value judgment has been widely discussed at an individual level (e.g. consumer desired values), particularly in the marketing literature and can easily be confused with values provided by retailers. However, these two concepts are quite different. The prior one is about one's personal preferences. The later one is about the values provided by the website or perceived by consumers from shopping in the website. This means consumer shopping orientations could be generated by consumers before or during making a purchase decision, while received website values is commonly agreed to be an after-purchase evaluation. Although the definition of customer value proposed by Woodruff [48] has received considerable attention over past decades which asserts that consumers typically involve a tradeoff between what they get and what they sacrifice in order to acquire a product or a service, such definition seems to be debatable in regards to the consumer shopping process because there are fundamental differences between initial-purchase and post-purcha se value assessment [22]. For example, in the initial-purchase stage, the consumer may evaluate their value orientations by weighing the anticipated sacrifices of a product or a service against its anticipated benefits and decide to buy if the latter outperform the former. In the post-purchase stage, the consumer may reevaluate their received values from the website by comparing the ratio between the actual sacrifices and the actual benefits and be intended to repurchase if the latter outweigh the former. Obviously, the value dimensions which the consumer tradeoff in the post-purchase stage is not necessarily the same as those considered in the initial-purchase stage [35]. Analogous to online shopping, if consumers encounter ill-fitting values, they leave the website for the time being. The consumers will probably search for another website and continue the shopping processes until they find the required one. Therefore, it is necessary to separate the concept of value orientations from the experience with the received website values, value orientations here can be formed without the website being used, while received website values only depends on experience of having used the website.

2.2 Consumer received website values

Since online shopping is our research setting, it is necessary to discuss the transmission of values from a provider through a website to a consumer. In the marketing literature, consumer received website value can be divided into two types: (1) functional value and (2) emotional value. Functional value is the utility derived from the perceived quality and expected performance of the product [40]. For example, when consumers want to know what they have searched last time, they may satisfy their functional values by using web cookies. Specifically, when consumers purchase online, they can return later and the chosen products are still in their shopping carts. These are beneficial to
consumers because they do not need to perform “search for alternatives” again. On the other hand, emotional value is defined as the utility derived from the feelings or affective states that the product generates [40]. For instance, when consumers can have fun while negotiating for the price by using a collective bargaining service from the website, they fulfill their emotional values. However, it is important to note that the term “utility” here represents a subjective measure of the usefulness or desire satisfaction that results from consumption [50]. Functional value and emotional value should occur only when consumers actually experience what they have received. We therefore define functional and emotional values as technical benefits that consumers can obtain by using the shopping website and mental benefits that consumers can obtain by visiting the shopping website, respectively. These two value dimensions seem to be most universal to represent the concept of consumer received website values.

2.3 Website values, shopping satisfaction, and repurchase intention

In this section, we propose a theoretical view of the antecedents and consequence of shopping satisfaction and discuss how they are related. We assume that exogenous constructs (i.e. functional and emotional value) influence shopping satisfaction, which in turn determine the endogenous construct (repurchase intention). Theoretical foundation for this assertion can be attributed to a well-established framework in attitude literature [2]. This framework posits that cognitive beliefs are the major determinant of affection, which in turn predicts conation (or behavior). Cognitive component of the framework consists of consumers’ perception about a product, such as its attributes and benefits. Affection is a consumer’s feeling or emotions about using a product. The conation of the framework encompasses a consumer’s intention to do something in some way regarding a product. Contrasting this framework to our research context (as illustrated in figure 1), we can identify: (1) Functional and emotional values reflect consumers’ trade-off between the actual sacrifices and the actual benefits of using a website and thus are regarded as cognition component. (2) Shopping satisfaction plays the mediating role in the relationship between cognition and conation. (3) Repurchase intention concerns a disposition to behave positively toward a website. This framework provides us with a strong theoretical basis for measuring that shopping satisfaction mediates the effect of website values on their repurchase intention. Accordingly, consumers would reconsider their shopping experience of using the website during the repeat purchase stage and decide whether to revisit it or not if they receive both functional and emotional values from that website. We propose the following hypotheses:

H1. Consumers are more satisfied with shopping websites of higher received functional value.
H2. Consumers are more satisfied with shopping websites of higher received emotional value.
H3. Higher levels of shopping satisfaction result in higher levels of intended repurchase.

2.4 Consumer shopping orientations

Although the concept of consumer received website values (or consumer value delivery) have been highlighted in current business practices and academic literature for over few decades, only a small number of studies have investigated the concept of consumer shopping orientations. What online consumers really desire and why they are shopping online in first place remain unclear. Value is a two-way concept, as we mentioned, consumers will compare their perceptions of the value received with the value desired. Understanding what consumers value and how the solutions a firm provides meet those values are key to developing an effective marketing strategy. In order to advance the practice of management toward consumer desired values, researchers (e.g. [6][16]) argued that consumers should shop differently depending on whether their shopping orientations are primarily goal-focused or recreational. We now explicitly describe these two categories specifically for an online shopping environment.
Consumers who are interested in goal-focused shopping are concerned with buying products or services in an efficient and deliberate manner to accomplish their goals with a minimum of distraction [10]. For example, online consumers may feel that the website facilitates with their utilitarian need as search efforts for product information are significantly reduced. Consumer focus group research [47] also depicted that “What I want from online shopping is the opposite of browsing, just show me what I want fast and get me on my way.” These represent that consumers do not necessarily think of shopping online as shopping, rather, they treat it as task-oriented transaction. Thus goal-focused consumers engage in shopping out of necessity to obtain desired products or services with little entertainment derived from shopping activity itself [29]. The construct of utilitarian shopping value proposed by Babin et al. [3] seems to the best representative of goal-focused consumer because they defined that utilitarian value is derived from task completion, the achievement of a desired outcome that the consumer is pursuing out of necessity. To assist in the operationalization of the latent concept of goal-focused shopping, we therefore refer to goal-focused shopping as the “utilitarian shopping value orientation.”

Despite the advocate of goal-focused shopping, there is evident that some online consumers engage in recreational shopping [36]. Recreational shopping orientation describes consumers engaging in shopping to derive inherent enjoyment from the shopping activities itself [29]. Unlike goal-oriented consumers desire to commit to their goal, in this case, the shopping activities are performed without purpose, and there is no need to engage in it. An obvious example is that consumers may purposelessly access shopping website from one end to the other and that takes their leisure time a lot because so many potential surprises out there and they gradually get immersed in it. As we mentioned above, recreational shopping is also a latent concept which is difficult to measure. We therefore treat recreational shopping as “hedonic shopping value orientation” so that the latent concept becomes measurable. In sum, online consumers are not passive recipients of value delivery but are instead active players who obtain desired values in the online shopping. However, nearly all studies investigating such concepts have been in the context of physical storefront, very few of them have concerned whether the two-way value concept discovered in the in-store marketing literature is equally applicable to the context of online shopping. The remainder section of this research attempts to address this issue.

2.5 Task-Technology Fit theory

A majority of the conceptualizations of information technology (IT) adoption have drawn on robust theories from the MIS literature, especially the technology acceptance model (TAM), diffusion of innovation (DOI), and task-technology fit (TTF). TAM was developed to explain and predict work place technology adoption. Two major antecedents of behavioral intention were introduced—perceived ease of use and perceived usefulness. Perceived ease of use is “the degree to which an individual believes that using a specific system would be free of effort,” and perceived usefulness is the “degree to which an individual believes that using a specific system would increase her/his job performance.” Although TAM has been empirically tested, and has also contributed to the explanatory power of IT adoption models, it has been criticized for its parsimonious structure [9]. A major weakness of TAM for studying IT adoption is its lack of task focus [17]. The lack of task consideration in investigating IT usage or its performance leads to the controversial results in IT evaluation [24].

The second model, diffusion of innovation addresses that innovation adoption is a process of uncertainty reduction. Individuals gather and synthesize information about a new IT from the social system within which they are situated [37]. This information processing results in the formation of beliefs about using a particular IT. Empirical studies of DOI in the discipline of MIS have largely supported the predict power of the theory ([12][19][20]). However, DOI has its unavoidable limitations: (1) DOI explains the formation of a favorable attitude toward a particular innovation; however, it does not provide further analysis of the attitude evolving into the adoption behavior [9]. (2) A central notion in DOI is that new technologies possessing favorable attributes tend to be more useful and easier to adopt and thus tend to diffuse more quickly than those with less favorable attributes [37]. However, many consumers are now shopping online; buying products or services from websites is not a new technology to them. Thus, DOI appears to be inappropriate when the research focus is online shopping, specifically in repurchase intention or behavior.

The last model, task-technology fit is the major theory concerned in our research. TTF is defined as the correspondence between task requirement, individual abilities, and the functionality of the technology [24]. That is a technology will be adopted if it provides a good fit with task it supports. This fit concept has also been utilized in MIS research such as system implementation [34], and system maintenance [17]. In contrast to TAM and DOI, TTF
provides a greater insight into the topic of technology repeat usage in that experienced user will choose tools or methods that help them to complete the task with the maximum benefits. In other words, information technology that does not provide enough advantage will not be used. Given the descriptions of TTF, it is necessary to identify TTF elements (i.e. technology characteristic, task characteristic, and individual ability) used in this research (as illustrated in figure 2).

**Figure 2. Task-technology fit model [24]**

*Technology characteristics*

Technology characteristics are defined as system features employed by users in carrying out their intended tasks [24]. In the context of online shopping, technology characteristics refer to functional and emotional aspects provided by the website to assist consumers in their shopping task.

*Task characteristics*

Task is widely defined as the action or behavior requirements carried out by system users in turning inputs to outputs ([24][51]). Because required behaviors can vary from one task to another, it is argued that behavior requirements can reasonably be viewed as characteristics of tasks [25]. According to the description proposed by Goodhue and Thompson [24], “task characteristics of interest include those that might move a user to rely more heavily on certain aspects of the information system.” In regard to our research setting, the desire to obtain utilitarian and hedonic values about shopping online would move a consumer to depend more heavily upon the technology characteristics (i.e. functional and emotional values) provided by the website. Thus, utilitarian and hedonic values are desires of a consumer’s use of a website, rather than of the website per se.

*Individual abilities*

Individuals (e.g. marketing manager, system analyst, computer end-user) may adopt technologies to assist them in the performance of their intended task. However, before they actually use the system, some abilities need to be preliminarily carried. In the test of TTF, individual abilities have been operationalized as computer knowledge or experience with particular IT [23]. These abilities could affect how easily and well the users will adopt the system [17]. However, since our research focus is repurchase intention, consumers familiar with online shopping should be able to find what they want, therefore, individual abilities are reasonably excluded.

*Task-technology fit*

TTF is a key but underestimated concept in understanding the impact of technology on consumer behavior. TTF is defined as the degree to which a technology assists an individual in performing her/his intended tasks [24]. Obviously, the fit between task requirements and technology characteristics is of important prerequisite that determines subsequent performance. Thus, in addition to the question of how well the website features (i.e. functional and emotional values) affect consumers’ shopping satisfaction (hypotheses 1 and 2), there is also the question how well these features provided by the website fit shopping requirements (i.e. goal-focused and recreational) For example, consider a shopping website. One technology characteristic is the extent to which the product information on the website is well-integrated (i.e. with consistently integrated product information across all the web pages). Integrated information would be useful if there is a shopping requirement for efficiently comparing price information across products, but probably not if the need is for single product information. Not to come singly but in pairs, avatar design could be another technology characteristic provided by the website. Avatars are virtual
characters that can be served as website guides. In this case, avatar has the potential to fit the consumer’s desires not only for usefulness but also for entertainment [45]. Therefore, e-marketers should expect that any given characteristic of web technology will have different impacts on consumer behavior, depending upon the shopping requirements. Based on the preceding discussion, we posit that consumer shopping orientations moderate the effect of consumer received value on shopping satisfaction (as illustrated in figure 3) and propose the following hypotheses:

H4. Utilitarian orientation moderates the relationship between functional value and shopping satisfaction.
H5. Hedonic orientation moderates the relationship between emotional value and shopping satisfaction.

Figure 3. The conceptual model (full model)

The rationality of fit as moderation could be supported by Venkatraman [43]. His research demonstrated that the interactive effects of strategy and managerial characteristics have implications for performance. Therefore, in regards to our research, the effect consumer received website values have on shopping satisfaction is depending on their value orientations. In our knowledge, research of online shopping has not been previously modeled using task-technology fit concept, except for the research conducted by Klopping and Mckinney [30]. Although the subject of our research is similar to them, we illuminate distinct concept (two-way value) influencing online shopping behavior.

3. Research Methods

3.1 Data collection

The data for our study were collected through a web-based questionnaire. We set up an online survey website that was advertised on online forums with very heavy traffic, such as the biggest portal (Yahoo! Kimo; www.yahoo.com.tw), the top shopping store (PChome; www.pchome.com.tw) and the largest BBS (www.ptt.cc/index.html). Tan and Teo [41] have suggested that online surveys have some advantages over
traditional paper-based surveys, including lower cost, rapid response and lack of geographical limitations. The primary units of analysis in this study are individual consumers with experience in online shopping. As an incentive, we offered prizes to respondents who answered all the questions.

The survey yielded 188 usable responses. About 62.2% of the respondents were female, 37.8% were male, and at least 34.5% of them were students. Most of the respondents were in their twenties or thirties, and all the respondents are an experienced user of shopping websites. Table 1 summarizes the attributes of the respondents. According to the Market Intelligence Centre [31], a well-known consulting firm under Taiwan Institute for Information Industry (III), about 56% of people between 20 and 30 years old are frequent online shoppers. Although most our respondents were students, keep in mind that this group will become a primary segment of the online consumer population in the near future.

Table 1. Profile of respondents

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<thead>
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<th>Measure</th>
<th>Items</th>
<th>Frequency</th>
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<td>Student</td>
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<td>80,001~100,000</td>
<td>3</td>
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<td></td>
<td>Over 100,000</td>
<td>2</td>
<td>1.06</td>
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</table>

3.2 Measurement development

The questionnaires were developed using test statements taken from the literature. Functional value and emotional value were measured using 3 items; both categories were adapted from Overby and Lee [33]. Shopping satisfaction and repurchase intention were each measured by 3 items adapted from Harris and Goode [27]. Utilitarian and hedonic orientations were each measured by 3 items adapted from Babin et al. [3]. Respondents were asked to rate each item on a seven-point Likert scale, where 1 meant ‘strongly disagree’ and 7 meant ‘strongly agree’. A pre-test and a pilot test were conducted to validate our instrument. The pre-test involved 5 participants (two MIS professors, one website engineers and two online shoppers) who were familiar with online shopping. They were asked to provide comments with an eye towards eliminating repetition and items not oriented towards the consumer. In the pilot test, we invited 30 respondents from the population of online shoppers to participate. The actual items used to measure each construct are listed in Table 2.

4. Data Analysis and Results

4.1 Data analysis
The analysis of the data was done in a holistic manner using partial least squares (PLS). The PLS procedure [46] allows the researchers to both specify the relationship among the conceptual factors of interest and the measures underlying each construct. The result of such procedure is a simultaneous validation of “how well the measures exhibit an acceptable level of convergent and discriminate validity” and “whether the hypothesized casual relationships at the theoretical level are empirically confirmed”. Moreover, due to non-normality of our research data\(^1\), structural equation modeling is not appropriate [11]. PLS, on the other hand, is considered as a better method because it does not require multivariate normal distributions [21]. Compare to SEM, PLS is more emphasis on explanatory power by maximizing the variance explained in constructs rather than model fitness [5]. With the prediction needs of our research purpose, PLS is reasonably considered for this research.

In testing the interaction effect of consumer desired values on the relationship between consumer received values and shopping satisfaction, we followed a hierarchical process similar to multiple regressions proposed by Chin et al. [11] in which one compares the results of two models (one with and one without the interaction construct). The significance of moderating effects was tested and interpreted according to the formula proposed by Carte and Russell [8] which monitors the difference between the squared multiple correlations (\(R^2\)). Cohen [13] suggested that the overall effect size (\(\Delta R^2\)) for the interaction could be small (0.02), moderate (0.15), and large (0.35).

### 4.2 Measurement model validation

The measurement model in PLS is investigated in terms of factor loadings, composite reliability, and discriminant validity. Hair et al. [26] recommended an acceptance level of 0.7 for both factor loadings and composite reliability. All of the constructs in our model meet this criterion (see Table 2).

<table>
<thead>
<tr>
<th>Construct</th>
<th>Measure</th>
<th>Factor loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Functional</td>
<td>value</td>
<td>(FV)</td>
</tr>
<tr>
<td>composite reliability = 0.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FV1</td>
<td>The price of the produce and/or services I purchased from this Internet Retailer are at the right level, given the quality</td>
<td>0.83</td>
</tr>
<tr>
<td>FV2</td>
<td>The products and/or service I purchased from this Internet retailer were a good buy</td>
<td>0.88</td>
</tr>
<tr>
<td>FV3</td>
<td>This Internet retailer offers a good economic value</td>
<td>0.84</td>
</tr>
<tr>
<td>Emotional</td>
<td>value</td>
<td>(EV)</td>
</tr>
<tr>
<td>composite reliability = 0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EV1</td>
<td>This Internet retailer does not just sell products or services, it entertains me</td>
<td>0.86</td>
</tr>
<tr>
<td>EV2</td>
<td>Making a purchase from this Internet retailer site gets me away from it all</td>
<td>0.88</td>
</tr>
<tr>
<td>EV3</td>
<td>Making a purchase from this Internet site truly feels like “an escape”</td>
<td>0.86</td>
</tr>
<tr>
<td>Shopping</td>
<td>satisfaction</td>
<td>(SA)</td>
</tr>
<tr>
<td>composite reliability = 0.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SA1</td>
<td>I am very satisfied with the value I receive from the shopping website</td>
<td>0.79</td>
</tr>
<tr>
<td>SA2</td>
<td>I have a positive attitude toward shopping website surfing</td>
<td>0.94</td>
</tr>
<tr>
<td>SA3</td>
<td>My interaction with the shopping website is very satisfying</td>
<td>0.88</td>
</tr>
<tr>
<td>Repurchase</td>
<td>intention</td>
<td>(RT)</td>
</tr>
<tr>
<td>composite reliability = 0.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT1</td>
<td>I intend to using the shopping website again rather than discontinue its use</td>
<td>0.83</td>
</tr>
<tr>
<td>RT2</td>
<td>I will regularly use the shopping website in the future</td>
<td>0.84</td>
</tr>
<tr>
<td>RT3</td>
<td>I will continue using the shopping website in the future</td>
<td>0.84</td>
</tr>
<tr>
<td>Hedonic</td>
<td>orientation</td>
<td>(HO)</td>
</tr>
<tr>
<td>composite reliability = 0.89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HV1</td>
<td>Spending time shopping is truly enjoyable</td>
<td>0.88</td>
</tr>
<tr>
<td>HV2</td>
<td>When shopping, I feel a sense of adventure</td>
<td>0.88</td>
</tr>
<tr>
<td>HV3</td>
<td>Shopping truly feels like an escape</td>
<td>0.81</td>
</tr>
</tbody>
</table>

\(^1\) The collected data were tested for normal distribution by using the Kolmogorov-Smirnov test. The null hypothesis is that the data set is similar to the normal distribution. The results shown sufficiently small P-values (\(P < 0.001\)) indicating non-normal distribution.
Utilitarian orientation (UO)

composite reliability = 0.84

UV1 When shopping, I usually accomplish just what I want to buy 0.94
UV2 When shopping, I usually find items I am looking for 0.94
UV3 When shopping, I usually complete the trip quickly 0.83

In addition, note that for all constructs the extracted variance exceeds the expected variance (0.5) due to measurement errors alone. These results demonstrate the convergent validity of our measurement items. As a standard of discriminant validity, Hair et al. [26] suggest that the average variance extracted for each construct should be greater than the shared correlation between itself and any other construct. The results indicated that the shared correlation between each pair of constructs was less than the square root of average variances extracted, demonstrating a certain level of discriminant validity (see Table 3).

Table 3. The latent construct correlation matrix

<table>
<thead>
<tr>
<th>Construct</th>
<th>FV</th>
<th>EV</th>
<th>SA</th>
<th>RT</th>
<th>HO</th>
<th>UO</th>
</tr>
</thead>
<tbody>
<tr>
<td>FV</td>
<td>0.85</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EV</td>
<td>0.43</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SA</td>
<td>0.65</td>
<td>0.36</td>
<td>0.87</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RT</td>
<td>0.62</td>
<td>0.34</td>
<td>0.79</td>
<td>0.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HO</td>
<td>0.36</td>
<td>0.41</td>
<td>0.41</td>
<td>0.35</td>
<td>0.86</td>
<td></td>
</tr>
<tr>
<td>UO</td>
<td>0.02</td>
<td>0.07</td>
<td>0.06</td>
<td>0.04</td>
<td>0.06</td>
<td>0.81</td>
</tr>
</tbody>
</table>

Notes: FV = Functional value, EV = Emotional value, SA = Shopping satisfaction, RT = Repurchase intention, HO = Hedonic orientation, UO = Utilitarian orientation. Diagonal elements represent square root of average variances extracted (AVE), while off-diagonal entries represent correlation coefficients.

4.3 Estimation of the structural model

Hypotheses and moderating effects are tested by examining the standardized beta coefficients (std. β). In addition to path analysis, explained variance ($R^2$) in the dependent constructs is assessed as an implication of the overall predictive power of the proposed model. Table 4 shows the results of the PLS analysis of two models. The standardized beta coefficients are given along with their t-values. Model 1 shows that all paths are significant indicating support for all the proposed hypotheses. Both functional value (β = 0.60, P < 0.01) and emotional value (β = 0.11, P < 0.05) have significant positive effects on shopping satisfaction, confirming H1 and H2. As our anticipation, shopping satisfaction also has a significant positive effect on consumer repurchase intention (β = 0.79, P < 0.01), confirming H3. These findings generally confirm the attitude literature as we mentioned earlier and indicate that behavioral intentions is driven by individual’s attitude toward the behavior where attitude is a function of an individual’s beliefs.

Table 4. Results of path analysis

<table>
<thead>
<tr>
<th></th>
<th>Reduce mode (model 1)</th>
<th>Full model (model 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FV → SA</td>
<td>0.60 (7.66) **</td>
<td>0.76 (5.13) **</td>
</tr>
<tr>
<td>EV → SA</td>
<td>0.11 (1.86) *</td>
<td>0.81 (2.89) **</td>
</tr>
<tr>
<td>SA → RT</td>
<td>0.79 (28.86) **</td>
<td>0.79 (24.49) **</td>
</tr>
<tr>
<td>UO → SA</td>
<td>—</td>
<td>0.28 (1.88) *</td>
</tr>
<tr>
<td>HO → SA</td>
<td>—</td>
<td>0.76 (3.95) **</td>
</tr>
<tr>
<td>UO×FV → SA</td>
<td>—</td>
<td>-0.32 (-1.78) *</td>
</tr>
<tr>
<td>HO×FV → SA</td>
<td>—</td>
<td>-1.13 (-2.57) **</td>
</tr>
<tr>
<td>$R^2$ in SA</td>
<td>0.43</td>
<td>0.49</td>
</tr>
<tr>
<td>Change in $R^2$</td>
<td>—</td>
<td>0.06</td>
</tr>
<tr>
<td>Effect size</td>
<td>—</td>
<td>0.11</td>
</tr>
</tbody>
</table>

Coefficients are presented with t-values in parentheses.

Effect size can be calculated by the formula \([{(R^2_{full} - R^2_{reduce}) / (1 - R^2_{full})}]\).
FV = Functional value, EV = Emotional value, SA = Shopping satisfaction, RT = Repurchase intention, HO = Hedonic orientation, UO = Utilitarian orientation.

The results of full model (model 2) give a standardized beta coefficient of 0.76 from functional value to shopping satisfaction, 0.81 from emotional value to shopping satisfaction, main effect of 0.28 from utilitarian orientation to shopping satisfaction, main effect of 0.76 from hedonic orientation to shopping satisfaction, and interaction effects of -0.32 and -1.13, respectively. These results show strong support for moderating effects of consumer shopping orientations. That is, one standard deviation increase in utilitarian orientation will not only impact shopping satisfaction directly by 0.28, but it would decrease the impact of functional value from 0.76 to 0.44. Similarly, as hedonic orientation increased, the relationship between emotional value and shopping satisfaction will go down. As hypothesized we proposed, the moderating effects of consumer value orientations (effect size = 0.11) have a significant change in $\Delta R^2$ ($F=6.07, P<0.05^2$, and thus confirming H4 and H5 (as illustrated in figure 4). It is important to note that a small to moderate effect size (0.02–0.15) does not necessarily imply an unimportant influence. This is because the full model resulted in largely higher standardized beta coefficients in comparison with the reduced model.

![Figure 4. Results of path analysis (full model)](image-url)

Insight of these changes are three folds: (1) With the concept of task-technology fit which task characteristics (goal-focused or recreational shopping) play a critical role in attenuating the strength of consumer received website values — shopping satisfaction relationship, unless the website features (functional and emotional aspects) do well-fit consumer shopping requirements. (2) Theories of contingent strategy characteristics – firm performance relationships are being more commonly accepted with empirical findings (e.g. [43]). It is therefore reasonable to conclude that consumer received website values — shopping satisfaction relationships may also be susceptible to exogenous contingent constructs as well. Given the current study findings, the impact of functional and emotional values on shopping satisfaction is negatively moderated by consumer value orientations. Interestingly, the $R^2$ of shopping satisfaction controversially increased if we add these two moderators together to the conceptual model. One possible explanation is that the greater the shopping orientation the consumer perceives the higher variation in received website values the shopper will tolerate before changing affects and intentions. Indeed, consumers’ expectations are usually unstable and unlimited whereas companies resources are conversely scarce and insufficient. When these affordable resources surmounted by consumers, the value advantages originated in the website will be eliminated. (3) Despite the fact that online shoppers tend to be goal-focused (reduced model), recreational shopping orientation is also desirable as it is associated with more emotional aspects. In our case, hedonic orientation is a reflection of consumers who have experienced a certain level of emotional worth from the shopping website. This finding is consistent with the assertion proposed by Wakefield and Baker [44] that consumers who receive positive

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$2$ We use the formula proposed by Carte and Russell (2003) for calculating the significance of the change in the $R^2$. $F=[\Delta R^2/(df_{full}-df_{reduced})] \div \left[ (1-R^2_{full}) \times \left( \frac{N-S-1}{df_{full}} \right) \right]$
emotions from the website in fitting their hedonic needs are thought to form strong commitments (such as word of mouth and loyalty). Therefore, it is reasonable to conclude that emotional value/hedonic orientation interaction plays a stronger driver of shopping satisfaction than functional value/utilitarian orientation interaction. In sum, e-markets should take these considerations into account.

5. Discussion

No doubt that e-commerce is continuing to have a profound impact on MIS discipline. To date, only a few studies that used task-technology fit concept to investigate online shopping behavior. However, use may be related to how well the consumer feels website features fit the shopping tasks. Unlike previous research which has emphasis primarily on determinants of shopping satisfaction, we extend this perspective by finding support for significant interactions between technology characteristics and shopping requirements. Specifically, we found that the congruence between a technology and a task can be interpreted as the extent to which a shopping task can be performed extrinsically and intrinsically with particular website features. This research also makes an important contribution to the MIS literature by providing a theoretical validation of how online shoppers functionally and emotionally process shopping activities with their inherent expectations.

For practical implications, our findings suggest that practitioners should not only tenaciously consider the consumer received website values but also put more emphasis on their value orientations. Consumer received functional and emotional values are probably necessary but are an insufficient precondition for cultivating shopping satisfaction. Therefore, e-marketers should develop a value delivery strategy that is most concerning for their customers. In regards to consumer value orientations, both utilitarian and hedonic anticipations should also simultaneously take into consideration. In fact, some websites simultaneously offer both goal-focused and recreational benefits to their customers. For example, the virtual reality feature of Honda Car website (www.honda.com) that allows prospectors to appreciate the car from every angle alleviate goal-focused visitors’ needs about the car information, while engaging recreational visitors with passionate music or self-painted exterior color of the car. Furthermore, hedonic orientation plays a slightly higher influence on shopping satisfaction than utilitarian orientation. Online shoppers will consider whether the emotional features provided by the website would fulfill their recreational needs. When a shopping experience is exceptionally desirable, consumers are more intent to share their feelings with others and encourage friends to patronize that website [4]. If this is true, marketing strategy may be effective in keeping costs down.

6. Limitation and Future Research

Despite our study findings have important implications for shopping websites, some limitations of the research must be acknowledged. First, most of our respondents were students, however, as younger students who have grown up on the website become full-fledged shoppers, recreational aspects are likely to become desirable, even if they do not have too much money to buy something. We thus encourage future research to identify additional segment in the context of online shopping. Second, TTF originally applies to IT usage behaviors that are under managerial fiat. While mandating technology use can provide the impetus to overcome initial inertia associated with a technology [1], such effects may not be suitable for online shopping. Since online shopping behaviors are always under the volitional control of consumers. Third, although we used the same respondents for evaluating research constructs, the moderating effects of the research model minimizes potential common method bias. According to Evans [18] argument, if the moderating effects have significantly been found, will provide a strong implication of the lack of common method bias. This is because all the respondents are hardly anticipating the items’ non-linear relationships and answer accordingly.

References


Approaches to Customer-Focused E-Marketing

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Abstract

E-marketing is an important area for leading edge businesses. The paper discusses new and practical ways to enhance business-to-customer e-marketing, such that strategically enhanced marketing solutions may result. New approaches to e-marketing now capture strategic marketing solutions. The business strategic marketspace may be constructed into a combined product life cycle and time-lined strategic toolkit. Website tools may allow the business to test its product - from idea generation to product launch, and then through into a product life-cycle selling situation. To build these early stage e-marketing solutions, recently released interactive tools, termed web 2.0 tools, including Facebook (www.facebook.com) and Second Life (www.secondlife.com) may be engaged. These web 2.0 tools, may be further strategically deployed across various components of the business’s new product e-marketing life cycle development.

Keywords: e-marketing, marketspace, technology, marketing, strategy, competitiveness, product life cycle

1. Introduction

The internet has become a powerful global reach tool for business today. Businesses seeking to reach out into these new markets are often attempting to engage more closely with customers. This e-marketing approach has delivered the business website, and the business website has in-turn become another communications channel for the business. As websites have developed, they have also become more focused. Businesses with on-line approaches have sought to meet their customers’ (or website visitors’) needs. This focus has driven the business website towards delivering a total customer experience, and several authors have described various consumer-based approaches [6],[10],[16],[15].

E-marketing plays a vital role in such activities, and many approaches have been trialed. To date e-marketers win business by their relative strategic position on web crawlers, their banner add linkages, their sales and after sales communications use, their value adding, their branding and company profile, their price, their innovation, their strategy and marketing, and the like. However these are approaches are often readily copied. The e-marketer works in a dynamic, change-ridden customer targeting environment. There is often a need to continually seek out, and to implement more dynamic, and new, e-marketing approaches. In 2004 Mohammed, Fisher, Jaworski and Paddington [13] re released their 2002 approach – previously developed at eBay. This approach developed an e-marketing matrix consisting of seven C’s.

2. The Seven C’s

Mohammed, Fisher, Jaworski and Paddison [13] mapped the marketing mix parameters, company branding, website interactivity and website individualization solutions into a strategic matrix framed at points in time This strategic matrix has since been drawn into different customer-targeted e-marketing models [1],[5],[7],[8]. Mohammed et al’s [13] seven C’s approach engaged both on-line and off-line solutions, but the model was also applicable to straight on-line businesses. The seven C’s engaged were: (1) context – housing website layout, design and feel, (2) content – capturing text, image, audio, video and graphics, (3) connection – linking websites and internally linking-website pages by appropriate hyperlinks, (4) communication – between customer-to-website and customer-to-customer via website, (5) community – building services relationships between customer(s) and website, (6) commerce – the website knowledge transactions and sales functions and (7) customization – the website’s ability to be personalized by the customer.

Whilst the 7C’s framework provides a useful insight into the different design elements that companies should consider when developing websites, it gives little indication as to which elements should be considered critical for the success of a website, and whether importance attached to each of the elements should be varied depending on the scope and scale of operations of a business, or which of the 7C’s would be most appropriate to target a market.

Mohammed et al [13] mapped the marketing mix parameters, company branding, website interactivity and website
individualization solutions into a strategic matrix framed at points in time. This strategic marketing matrix has been drawn into different customer-targeted e-marketing application models [1],[5],[7].

Askim-Lovseth and O’Keefe [1] used Mohammed et al’s seven C’s as a foundation base that captured the business website interface, and mapped these against the marketing value-bubble fields of: attracting, engaging, retaining, learning and relating. Thus, Askim-Lovseth and O’Keefe’s model (shown as Figure 1) adopted a customer learning, and relating, model built around the marketing objectives of the business. A multi-dimensional, multi-layer structural model of customer attitudes then helped to align the business marketing objectives, finally developing an overall index or measure of achievement. Whilst this approach is useful, it is primarily a point-in-time approach, and it is not directly customer driver. Nevertheless, is useful to help map parameters to an initial new website placement.

Today’s e-marketing solutions generally work in dynamically changing environments. Hence, websites with well developed business tools are capable of delivering levels of dynamic change – roughly in line with customer demands, and often delivering better and expanded, e-marketing framed, customer targeted solutions. These approaches are generally more customer focused than those offered via static approaches.

Hamilton and Selen [9] and Gunesh and Hamilton [5],[7] showed that the strategic seven C’s website marketing approach displayed incompleteness when applied in conjunction with a strategic positioning approach, and at the more detailed personalized level. Another e-marketing ‘C’ dimension (or eighth ‘C’) termed ‘characterization’ was therefore included to cater for this higher level of business-customer engagement. ‘Characterization’ was termed to capture the intelligent business website’s ability to more closely adapt to its individual customers, and to deliver on-line-stimulated changes that better targeted the individual customer. This required new levels of business intelligence, ones that allowed the on-line business website to be more closely mapped at the customer interface end [7],[8]. This intelligence may then be built into a ‘Services Gateway’ [8]. This approach allowed the website interface to be further treated – with various customer visible and controllable areas being capable of modification as response solutions to a customer request or demand. For example, a service or product variation may be offered to the specific customer, a specific personalization option may be offered to a customer’s website engagement region or a entry page variation may be allocated to a specific user. This approach encouraged has been shown to yield closer customer alignment [7]. Thus, the customer was able to see a partially ‘made-to-order’ personalized website interface, with visible items specifically arranged according to individual customer requirements.

Figure 1: The Customer Centric Value Assessment Model, adapted from Askim-Lovseth and O’Keefe, 2008

Hamilton’s [7] approach used the eight C’s of the website interface customer engagement, and linked them to service value networks approaches [7]. This approach delivered a statistical mechanism from which pathways to customer alignment were elucidated and understood. Combined with business intelligence, and a full services gateway approach, a highly-responsive, interactive, business-customer alignment approach was delivered. This new approach enabled the business to move closely with changes in its customer sets’ needs, wants, desires, and net
benefits. The business website was moved to a new competitiveness position – one where the individual user was perceived as more closely aligned to the individual customer’s desire.

As part of the services gateway solution a strategic marketspace matrix may be developed. This strategically positioned, business-specific, integrated on-line and off-line strategic marketspace matrix (shown in part as Figure 2), when combined with a time-lined product-life-cycle approach of successive overlavings of innovations and marketing additions (and at the appropriate levels of eight C’s involvement) delivered a new competitive pathway that captured both the off-line and on-line marketing dimensions. This solution set when embedded into the original services gateway solution moved the model to new statistically positioned levels of customer engagement – one capable of catering for changes in website scoping over time [7],[8]! The strategic marketspace matrix, over time, incorporated new innovations and new marketspace requirements. In addition, it also strategically incorporated new degrees of interactivity and individualization and so moved the more skilled website user to greater levels of engagement. This approach when built and implemented as time overlays, also extended the dimensions of customer engagement. Once the normal customer targeting has slowed this approach may also be applied to Kim and Mauborgne’s [11] tiered non-customer groupings.

![Figure 2: Strategic Marketspace Matrix, Hamilton, 2007](image)

These approaches build new marketing perspectives from which to tackle e-marketing solutions. But the dynamic e-marketing approach is more in-tune with the ever-changing dynamic of the internet. The skills required to move into the dynamic strategic marketspace arena remain quite extensive, and they capture areas including: website design, strategic website positioning, strategic marketing strategies, integrated business databases, logistics, e-commerce, security, all dimensions of servicing, innovations, communications channels, combined with a ‘service value networks’ approach. This approach offers a means to develop a fairly unique business solution set [7],[8]. To build such dynamic solutions it is necessary to incorporate emerging technologies.

### 3. Dynamic E-Marketing, Emerging Technologies and Tools

To value add to a website, traditionally more information or approaches has been the solution offered. The internet and its connectivity tools have continued to evolve. A recent 2008 Australian study conducted by eMarketspace estimated that well over 90% of Australian businesses with websites did not use, or deploy, any web 2.0 features. A small tertiary student study conducted in a regional Australian university showed that of the 152 undergraduate students surveyed in February and July 2008, 77% (or 117 students, 89 female) used their on-line social networks to source, and / or to confirm information - such as initial travel and accommodation plans, entertainment, latest products and the like. This survey further indicated that most female survey participants held (or utilized) an active
social website membership, and that most engaged in social website activities at least once a month. This convenience sample suggests tertiary students are one group that may be targeted by deploying web 2.0 e-marketing approaches, and that this emerging market may offer a possible rich source of additional marketing options to the astute e-marketer.

3.1 Internet and Web 2.0 Tools
Tim O’Reilly introduced web 2.0 in September 2005. Here, web applications were seen as involving web-sharing sites or applications, and were perceived to connect internet-savvy customers (or consumers) with websites deployed as business marketing channels that targeted the sale of services and/or products.

Today, websites have moved to become ‘communities-of-users’ destinations where vast arrays of communications and data swapping may occur. Today, the web 2.0 business website incorporating web 2.0 approaches is typically a social and rich-content customer exchange site, as well as a sales site. Thus it has typically become broad transaction(s) site, that also builds its business intelligence on its business-customer exchanges and/or its transaction feeds. Here, blogs, peer-to-peer networks, and content creation have extended well beyond the business enterprise. Thus, the website with strong web 2.0 environments is typically a website platform where rich, dynamic content may be read, written, or influenced, within social and/or collaborative arenas.

Many web 2.0 e-marketing opportunities have emerged. For example, there are e-marketing approaches whereby the social networks MySpace (www.myspace.com), Facebook (www.facebook.com), YouTube (www.youtube.com), Joost (www.joost.com) and virtual worlds like Second Life (secondlife.com), may be incorporated into business e-marketing solutions today. These emerging marketing tools, and their business-related areas, have been very poorly deployed into the realms of business e-marketing.

MySpace was launched in 2003, as a social network offering interconnectivity between user submitted friendship networks. It houses personal profiles, blogs, images, music, videos, multimedia, karaoke, bulletins, groups, polls, news, and the like. It can also be linked to mobile devices. It generates its revenue streams primarily from advertising.

Facebook, launched in February 2004 by a Harvard student Mark Zuckerberg, is a free-access, social network. Here users may send public (or private) messages, find people, build profiles (including images interests, and personal information), connect and reconnect with friends, and where the user may also allow selected access to their profiles. It generates revenue by advertising. Facebook now offers blogs with images and tags, text and chat facilities, virtual gifts and tied messages, and it is a useful communication and meeting tool.

YouTube released in February 2005 with embedded video clips is now owned by Google. It houses user-generated music videos, TV clips, and the like. It generates revenue through advertising, and via some sales avenues.

Joost launched in August 2007 is a developing open source system for third party developers, and for delivering on-line, peer-to-peer TV. As such, it does not require massive servers – with the bulk of content serving provided by a small number of clients, but with each client then pushing the video stream to more clients! Hence, the distribution costs are moved from the channel owner, out to the user – thereby making it a very profitable for Joost to push advertising out to its customers.

The above media are rarely tapped by e-marketers. One Australian e-marketer and its dating team have engaged with the medium Facebook. They have used this approach to rapidly build a large database of willing potential dating participants. This e-marketer has delivered the on-line dating product, and a significant, and growing, database. An addition to this approach is also engaging the medium Joost – using a desirable, quality video (clip or several video clips)! This approach expands the target marketspace, and it further publicises this dating agency. You Tube could also be used, in combination with a quality brand labelling, to further rapidly expose this dating business to yet another potential mass market. Thus, these relatively new internet tools, when applied as a ‘profiler’ and ‘social network/ information source, may give companies rapid exposure, unique working databases of clients, and quick profiles as quality service providers. Yet another approach is to move into a ‘virtual world’.

3.2 Virtual Worlds Web 2.0 Tools
‘Virtual worlds’ come in many forms – games, virtual pets, imaginary businesses, and the like, each offers a range of
computer simulation environments where users may interact with various sensory applications and manipulate various components, thereby modifying a real world situation – such options are usually presented in two or three dimensional space. Social interactions also occur. Here games, maps, forums, blogs, wikis, chat-rooms, sensors and the like, are often engaged. Today it is possible to own a virtual pet conduct a virtual business, conduct transactions, or even train or work in a virtual team. Virtual worlds may also provide an additional meeting place where the online business personnel, and the customer, may discuss and clarify, ideas, test products, practice launch a new and/or innovative product or service, gauge changing customer perspectives, and the like.

Virtual worlds products are sought and sold across the real global market space. Movies like ‘The Matrix’ have incorporated virtual worlds. Research is using this realm to source, and to improve, open source code, and to provide new tools for customer engagement. Companies are even using virtual teams, in differing time zones, places, spaces and cultures to deliver collaborative business and general solutions. Currently, there is an industry trading in virtual real estate.

The computer software company Apple uses Second Life to advertise latest and innovative ideas, and to seek feedback. Sun Microsystems uses their Second life ‘island’ to advertise new ideas/products, to exchange ideas and to help its employees. Others use virtual worlds to engage customer feedback to new ideas; or to better understand a proposed project, service and/or new marketing idea. Thus, virtual worlds like Second Life offer a new way to socialize, to meet others, and to discuss ideas in a safe and distant mode. The e-marketer may help the business to capture such opportunities by researching this realm, and also interacting with its participants. For example, by tapping such virtual worlds the e-marketer may further help the business to: compete, and/or acquire new markets, and/or gauge customer reaction, and/or receive feedback [2],[3],[4],[12],[14].

Table 1: Business Activity: e-Marketing New Products Activities in Second Life

<table>
<thead>
<tr>
<th>CUSTOMER ROLE</th>
<th>CUSTOMER AS RESOURCE</th>
<th>CUSTOMER AS CO-PRODUCER</th>
<th>CUSTOMER AS USER</th>
<th>CUSTOMER AS BUYER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>present</td>
<td>present</td>
<td>present</td>
<td>present</td>
</tr>
<tr>
<td>Context</td>
<td>present</td>
<td>present</td>
<td>present</td>
<td>present</td>
</tr>
<tr>
<td>Connection</td>
<td>present</td>
<td>present</td>
<td>present</td>
<td>present</td>
</tr>
<tr>
<td>Communication</td>
<td>present</td>
<td>present</td>
<td>present</td>
<td>present</td>
</tr>
<tr>
<td>Community</td>
<td>present</td>
<td>present</td>
<td>present</td>
<td>present</td>
</tr>
<tr>
<td>Commerce</td>
<td></td>
<td></td>
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<td>present</td>
</tr>
<tr>
<td>Personalization</td>
<td>present</td>
<td>present</td>
<td>present</td>
<td>present</td>
</tr>
<tr>
<td>Characterization</td>
<td></td>
<td></td>
<td></td>
<td>present</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>STAGE</th>
<th>Idea Generation</th>
<th>Concept and Design</th>
<th>Product Testing</th>
<th>Market Launch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Product</td>
<td>present</td>
<td>present</td>
<td>present</td>
<td>present</td>
</tr>
<tr>
<td>Concept and Design</td>
<td>present</td>
<td>present</td>
<td>present</td>
<td>absent</td>
</tr>
<tr>
<td>Competitive Contribution</td>
<td>present</td>
<td>present</td>
<td>absent</td>
<td>absent</td>
</tr>
<tr>
<td>Ongoing Development</td>
<td>present</td>
<td>present</td>
<td>present</td>
<td>present</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>NEW PRODUCT DEVELOPMENT PROCESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enkel, Perez-Freije &amp; Gassmann, 2005</td>
<td>Idea Generation and Concept, Design and Engineering, Test and Launch</td>
</tr>
<tr>
<td>Fuller &amp; Matzier, 2006</td>
<td>Idea Generation, Concept and Design, Product Testing, Market Launch</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BUSINESS ENGAGEMENT OF SECOND LIFE IN 2007</th>
<th>SOME BUSINESS APPLICATIONS</th>
<th>MOST BUSINESS APPLICATIONS</th>
<th>FEW BUSINESS APPLICATIONS</th>
<th>AVERAGE BUSINESS APPLICATIONS</th>
</tr>
</thead>
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</table>

Today virtual worlds area is being trialed by some leading edge businesses, and then only by engaging some of the
above tabulated stages. Lang, Fetscherin, and Lattermann [12] found only 22 major businesses were actually using a virtual worlds approach to explore opportunities, and then, each was doing so in a specific, and different manner. In their virtual worlds approaches the most prevalent areas of business activity were the Product Development Stages – captured in Table 1 under ‘Idea Generation’ and ‘Concept and Design’. The ‘Product Testing’ and ‘Market Launch’ stages are less broad, and typify a ‘zeroing-in’ on the customer. Such virtual worlds segmentation approaches offer e-marketers potential additional paths to test their new on-line businesses initiatives. Here, possible e-marketing areas, business product development, research, business roles, and customer roles may be tapped, and different aspects and / or levels of customer involvement, may assessed. These initiatives, when focused strategically as virtual worlds products/services models, may capture early-to-mid stages of Figure 2’s sales (or life cycle) curve.

Table 1 may be further developed into a business-specific, three dimensional marketing matrix capable of maximizing business yields, and mapping: (1) the 8C’s, (2) the product life cycle strategic matrix, and (3) the virtual worlds added new product development stage. The e-marketing virtual worlds approaches may be combinations of: (1) ‘profiling’, (2) MySpace, Facebook, YouTube and Joost ‘socialization data capture’ techniques that complement the different approaches of Mohammed et al [13], Hamilton [5],[7],[8] and Askim-Lovseth and O’Keefe [1]. These aspects may be added to the strategic marketspace matrix at appropriate time poisonings as shown in Figure 2, and may add additional value for the web 2.0 business and its to the marketing matrix solution.

It should also be noted that some aspects of virtual worlds may also be deemed to build anti-social behaviours. For example, on-line computer gamers often participate for hours in isolation from the real world and from interactions with others. In Second Life participants may create their own unique person along with specific characteristics and they may then live in a second life and in a virtual world. Here there is a virtual economy, virtual trading, virtual properties and lots of other possible activities as defined under the virtual world’s time-dependant conditions. Again this is an e-marketing opportunity. Here the business may use a game or facilities type structure to seek an in-depth analysis to a situation. For example, the Hotel group Starwood used second life as an instrument where customers could go to the hotel tour it and make recommendations regarding its design features – both its interior and exterior. This enabled them to add ideas, reevaluate their new and/or innovative additions and ultimately to build a hotel with the users ideas incorporated. This approach has application to many businesses seeking on-line solutions, but it must be remembered this feedback group is highly skilled and their views may not translate to those of the wider targeted community.

4. Discussion and Research

New tools for the e-marketer are continually emerging, as existing on-line socialization tools evolve, and as new ones emerge. The e-marketer may engage a host of approaches to build the net e-marketing solution. Web 2.0 tools combined into strategic overlaying marketspace matrices may be used to build such solutions. These approaches may be used to target: (1) profiling on-line customers, (2) database capture, (3) finding new opportunities and generating new ideas (4) designing new business activities, services or products, (5) evaluating and testing new ideas, (6) launching a new product, (7) seeking detailed assessments from more highly skilled internet users, (8) target a customer and in (9) building the net more competitive position of the business. Commercial business solutions incorporating the above have been built by applications teams associated with this researcher. For example, an online dating agency has been built and its initial database of participants or users established by viral marketing techniques – largely engaging Facebook and MySpace.

This paper links several new web 2.0 tools available to the e-marketer, and a range of e-marketing approaches – like service value networks and services gateways into the construction of enhanced e-marketing solutions. These network and gateway approaches offer several pathways that may be appropriately engaged to both capture, and direct, further e-marketing successes. These approaches are capable of being linked into ‘service value networks developed dynamic website modeling. Here, business-customer interface approaches [7],[8] are engaged and used to build business services gateways linking the business, the surrounding environment, and the customer into an interconnected contact network that engages the business back-end and delivers sound business generated solutions back to customer , and in response to the customer generated request.

To further develop competitive positioning in addition to the above solutions, comparisons using third party sites may be of use. For example, it is likely that many new products or services may have a near direct competitor (or at least an indirect competitor). Hence, visits to eBay, and / or similar ventures, may elucidate additional on-line
approaches that are being used by other e-marketers. These approaches may be added to the business intelligence toolkits and may then provide further insights into the business’s competitive strategies. These may be used to further modify the business’s final strategic marketspace matrices e-marketing solution. Thus, yet another way to possibly extend a service’s and/or product’s competitiveness is deliverable.

This researcher suggests these e-marketing approaches, when developed and incorporated strategically via time-lined overlays of marketspace matrices may offer new paths to elevated levels of business competitiveness. This e-marketing area is still in its infancy, and it continues to offer great marketing opportunities to business.

5. Conclusions

Today quality e-marketing approaches operate in a ‘change’ environment. E-marketing competitive solutions also mesh with the changing or dynamic environmental factors that impinge on the business and its strategies. By adding emerging web 2.0 internet tools such as discussed herein, and applying them strategically in a quest to reach, and better understand, its customers, the e-marketer may be able to develop new strategic, and possibly more competitive, business options. The considerations discussed herein offer a pathway to such strategic solutions.

This approach may also be applied to on-line and/or off-line marketing solutions. It may be time-lined, and built into new dynamic strategic marketspace matrices approaches that further link the tools above into new customer interface approaches – possibly involving service value networks and services gateways. These approaches may also offer closer customer alignment pathways. Such approaches also allow the business to more closely track, and respond to, the changing perspectives of its customers. Thus web 2.0 tools, combined into smart marketing business solutions may offer additional ways to enhance e-marketing competitiveness and to improve business understanding.

References

Dynamic Prediction of Retail Website Visitors’ Intentions

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Abstract

This paper presents a model for identifying general intentions of consumers visiting a retail website. When visiting a transactional website, consumers have various intentions such as browsing (i.e., no purchase intention), purchasing a product in the near future, or purchasing a particular product during their current visit. By predicting these intentions early in the visit, online merchants could personalize their offer to better fulfill the needs of consumers. We propose a simple model which enables classifying visitors according to their intentions after only four traversals (clicks). The model is based solely on navigation patterns which can be automatically extracted from clickstream. The results are presented and extensions of the model are proposed.

Keywords: Clickstream analysis, consumer behavior, e-commerce

1. Introduction

The classical consumer decision-making process suggests that consumers go through a series of steps (i.e., problem recognition, information search, evaluation of alternatives, intention, purchase, and post-purchase behavior [4]) while making consumption decisions. Furthermore, consumer behavior research suggests that, even during a particular decision-making step, consumers may have various intentions. For instance, Bloch, Sherrell, and Ridgway [1] suggest that during the information search step consumers perform pre-purchase (for the current purchase decision) search or ongoing search activities (for future purchase decisions). Thus, consumers who visit a retailer’s website may not be at the same level of purchase readiness and may have different intentions when entering this website. For instance, Moe [9] suggests that visitors can be categorized into various intention groups based on their clickstream. In this paper we emphasize the importance of dynamic identification and following the evolution of consumers’ intentions in order to provide personalized content which, in turn, might improve website effectiveness.

It is widely reported that most consumers visiting a transactional website do not complete a purchase during their visit [14]. As a result, website conversion rates (percentage of visitors who make a purchase) are very low, cart abandonment is frequent, and many consumers are dissatisfied with transactional websites [8]. If one could help retailers identify the intentions of visitors before they abandon the site, the websites could personalize their offers and consumers would be better served which, in turn, would improve customer satisfaction and conversion rates.

Marketing researchers are increasingly using clickstream (web usage) data, which was originally collected for website performance analyses. Clickstream data has been used to investigate consumer behaviors across websites (user-centric scenarios) [5] and within specific websites (site-centric scenarios) [14]. In the latter category, some studies focused on single visits to a given website [8], some dealt with multiple visits [3], while others investigated visits of both types [11]. Researchers engaged in this type of work have traditionally focused on such issues as: (1) clickstream or website-related variables that identify the goals which consumers are pursuing while they are navigating [11], (2) information search and usage [7], (3) the question of why consumers continue navigating through a website [3], (4) on-line decision-making processes [13], and (5) identifying which visitors are likely to make a purchase [8].

In marketing and e-commerce literature, clickstream analysis typically employs content-independent data, i.e., no information about the content of pages visited is analyzed. However, some studies included general types of pages consulted by consumers. For instance, it was found that consumers who enter a website with a clear purchase
intention visit fewer product category pages and more often repeat viewings of product pages than consumers with no clear purchase intention [10].

Others, in an effort to combine clickstream with rich content-dependent website data, have used concurrent verbal protocols [12]; consumers were asked to verbalize their thoughts while performing online tasks. However, as most qualitative research methods, verbal protocol analysis is very resource-consuming. Because of that, small sample sizes have been used and this may have limited the generalizability of the findings.

The proposed model distinguishes itself from previous approaches in the following two ways: (1) it provides results early in the session, thus enabling taking appropriate actions before the visitor abandons the website and (2) no additional knowledge about the consumer, other than the navigational pattern automatically extracted from clickstream, is assumed. These two properties enable practical applications of the proposed model to sessions which can not be handled by traditional recommender agents, in particular, when the identification of the visitor is not possible (e.g. the visitor did not log on) or when the identified customer exhibits atypical behavior (e.g. he or she is shopping for someone else). In addition, the proposed model contributes to the theory of e-commerce by demonstrating how much information can be extracted from the content-independent weblog without employing sophisticated and resource-consuming systems.

2. Methodology
2.1 Data Collection

The user data for this research project were collected in a laboratory setting at a major North-American university. The subjects were recruited from a group of actual consumers who responded to the invitation to participate in the study. The experiment required the participants to visit the particular website (an on-line music retailer). All participants were given an electronic gift certificate redeemable on this website in exchange for their participation.

The following data were collected for each individual traversal (click): session (user) id, time stamp, visited node (web page). The collected clickstream dataset consists of 138 sessions (2,798 traversals) performed on the website by 138 different users. Only 13 participants completed the purchase. The sessions were divided into two separate tasks:

**TASK A** (46 sessions) was a browsing task; the participants were asked to familiarize themselves with the website and were given an electronic gift certificate once they completed this task.

**TASK B** (96 sessions) was a shopping task; the participants were asked to shop for a CD and buy it with the electronic gift certificate if they found what they wanted.

The participants were surveyed before and after the experiment. The shopping sessions were recorded and played back to the subjects in order to give them an opportunity to explain their choices and evaluate the outcomes of the navigation process. The explanations and evaluation data were linked with clickstream data.

The average number of clicks was about 17 per session for **TASK A** (browsing) and about 22 for **TASK B** (shopping); the number of clicks per session ranged from 4 to 105. Figure 1 shows the relative frequency distributions of the number of traversals (clicks) per session for tasks A and B respectively. One can observe that most sessions consisted of 10 to 30 clicks.
Figure 1. Relative frequency distributions of the number of traversals per session

2.2 Data Transformation

For the purpose of this project, each traversal was marked as forward (F), backward (B), or search (S). The forward traversal results when the visitor chooses a hyperlink leading to the new (previously unvisited) content, whereas a backward traversal indicates a re-visited page. The search traversal results when the consumer chooses to use the search engine, thus bypassing the navigational structure. Figure 2 shows sample clickstream data tagged as F, B, or S. The numbers in parentheses indicate the number of times a given node (page) was revisited. For instance, the first clickstream sequence indicates that the participant visited two new pages, then used the search engine, then moved back to the previously-visited page, then used the search engine again, etc.

```
FFSB(2)SFSSSFSFB(2)FFFFFFFFF
FFFFFB(2)FFFFFB(2)FFFFFB(3)FFFFFFFF
FFFFFB(2)FB(2)B(2)SB(3)B(2)B(3)
FFFFSB(2)FB(3)FB(4)FSSSFSSSS
```

Figure 2. Sample clickstream data tagged as forward, backward, or search traversals

The proposed transformation resulted in a simple representation of the navigational paths taken by the visitors to accomplish their goals.

2.3 The Model

In order to classify visitors as either browsers or shoppers, we assumed that the differences in navigational patterns between these two groups can be measured using the number of times the search engine was used and the time spent viewing content pages prior to moving forward or backward in the website. If the intention remains constant one can expect that shoppers will use the search engine more often and spend more time reading the content of each webpage [9] early in the session. On the other hand, browsers are likely to use the search engine less often and spend less time reading the content of the pages visited [9] early in the session. Below we describe a model capable of classifying visitors as browsers or shoppers using clickstream data collected after k traversals.

Let \( m \) be the total number of sessions recorded. Let \( n_i \) denote the number of pages visited by the visitor in the \( i \)-th session (including the starting page). Let \( t_{ij} \) be the time spent by the visitor viewing the \( j \)-th page (\( j = 1, \ldots, n_i \)) accessed in the \( i \)-th session (\( i = 1, \ldots, m \)).
For each individual session $i$, and each individual traversal $k < n_i$, one can compute the total time spent on the website after the $k$-th traversal: $T_i^k = \sum_{j=1}^{k} t_{ij}$. Further, let $TF_i^k$ denote the total page-viewing time before moving forward computed after the $k$-th traversal in the $i$-th session. Similarly, let $TB_i^k$ be the total page-viewing time before moving backward computed after the $k$-th traversal in the $i$-th session. Also, let $CS_i^k$ denote the number of times the search engine was used after the $k$-th traversal in the $i$-th session. For example, $TB_{1}^5 = 67$ indicates that, after five traversals, the visitor in session 1 spent a total of 67 seconds viewing pages from which he or she moved “backward” in the website.

We propose the following binary logistic regression model to classify visitors as shoppers or browsers after the $k$-th traversal:

$$
\pi_i = \frac{1}{1 + e^{-\left(b_0 + b_1 \sqrt{TB_i^k} + b_2 \sqrt{TF_i^k} + b_3 CS_i^k\right)}}
$$

where and $b_0$, $b_1$, $b_2$ are the coefficients of the model, $e$ is Euler’s number, and $\pi_i$ denotes the probability that the $i$-th session is a shopping session.

### 3. Results

We estimated the parameters of the model for different values of $k$ (ranging from 2 to 10) using the available data. Smaller values of $k$ indicate the “early in the session” period, which is the most interesting from a practical standpoint. Table 1 presents the summary of the results of fitting of the proposed model. One can observe that the model works after only four traversals and seems to improve as the number of traversals increases.

<table>
<thead>
<tr>
<th>Table 1. Predictive model summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>K= &amp; 2* &amp; 3* &amp; 4 &amp; 5 &amp; 6 &amp; 7 &amp; 8 &amp; 9 &amp; 10</td>
</tr>
<tr>
<td>Hosmer-Lemeshow &amp; 0.18 &amp; 0.21 &amp; 0.46 &amp; 0.32 &amp; 0.20 &amp; 0.78 &amp; 0.81 &amp; 0.90 &amp; 0.88</td>
</tr>
<tr>
<td>Nagelkerke $R^2$ &amp; 0.30 &amp; 0.31 &amp; 0.30 &amp; 0.36 &amp; 0.40 &amp; 0.41 &amp; 0.41 &amp; 0.41 &amp; 0.46</td>
</tr>
<tr>
<td>Odds ratio (p&lt;0.05)</td>
</tr>
<tr>
<td>B1 (TB) &gt;10000 &amp; 1.18 &amp; 1.373 &amp; 1.53 &amp; 1.571 &amp; 1.368 &amp; 1.294 &amp; 1.264 &amp; 1.204**</td>
</tr>
<tr>
<td>Percentage of Shoppers</td>
</tr>
<tr>
<td>Naïve Rate &amp; 68.1 &amp; 68.1 &amp; 68.1 &amp; 67.9 &amp; 67.9 &amp; 67.9 &amp; 71.7 &amp; 71.7</td>
</tr>
<tr>
<td>Percentage of Correct Classification</td>
</tr>
<tr>
<td>Browser &amp; 61.4 &amp; 50.0 &amp; 63.6 &amp; 52.3 &amp; 54.5 &amp; 51.2 &amp; 59.5 &amp; 66.7 &amp; 79.4</td>
</tr>
<tr>
<td>Shopper &amp; 78.7 &amp; 84.0 &amp; 76.6 &amp; 86.0 &amp; 87.1 &amp; 90.1 &amp; 80.9 &amp; 79.8 &amp; 79.1</td>
</tr>
<tr>
<td>Overall &amp; 73.2 &amp; 73.2 &amp; 72.5 &amp; 75.2 &amp; 76.6 &amp; 77.6 &amp; 74.0 &amp; 75.8 &amp; 79.2</td>
</tr>
<tr>
<td>Cutpoint &amp; 57% &amp; 54% &amp; 59% &amp; 50% &amp; 47% &amp; 45% &amp; 57% &amp; 58% &amp; 63%</td>
</tr>
</tbody>
</table>

*) Fit is questionable; some odds ratios are probably infinite
**) p-value 10%
The cutpoints were chosen to maximize the percentage of correct classification. For cases in which multiple cutpoints resulted in almost the same percentage of correct classification (a difference of less than 1%), the cutpoint maximizing the lowest percentage between browsers and shoppers was chosen.

The results are generally consistent for all values of $k$. The model has a positive lift and the values of the coefficients of the model indicate that an increase of either TF, TB, or CF, increases the odds that the actual shoppers will be classified as shoppers by the model.

4. Conclusions and Future Research

In order to dynamically personalize offers during a consumer’s visit, an online retailer needs to identify the visitor’s intention. Once the intention is identified, it is then possible to communicate personalized and, thus, relevant information to the consumer.

This paper demonstrates that clickstream can be used to effectively classify visitors according to their intentions related to purchasing a product or service in the current session. The output of this model could serve as input to a recommender agent thus enabling better recommendations.

The data necessary for the proposed model (session ID, time stamp, node ID) are collected in real-time by both IIS and Apache Web servers, thus, the model could be implemented as a back-office process, i.e., the process running on the Web server.

At this stage we are unable to confirm whether this model works for other websites. We expect that the way in which the content is presented affects the time spent by visitors on each individual webpage and the number of times the search engine is used. Further research is required to test this approach on different types of websites. If the model proves applicable to most websites, future research will focus on understanding the detailed intention of visitors to the website, i.e., the product, service, or piece of information that the visitor is interested in. This, however, will require incorporating semantic information into the available content-independent clickstream data.

To accomplish that, we will use website ontologies. An ontology can be defined as a “formal explicit specification of a shared conceptualization” [16] or an “explicit specification of an abstract, simplified view of a world we desire to represent [6].” Our ontology will consist of terms (keywords and phrases), and relationships among these terms. Terms will be assigned to ontological categories (conceptual types) organized in the form of a lattice [15 p. 72]. A hybrid of the deductive and inductive approaches [6] to website ontology design will be used in this project. Therefore, in addition to clickstream data, we will use language constructs extracted from the website to dynamically identify consumers’ visit intention and predict the likelihood of purchase.

One can think of the resulting mechanism as of a software equivalent of a pro-active and attentive shopping assistant. We expect that this mechanism will provide some insight into inherent cognitive processes which make visitors choose certain hyperlinks over others. It is also expected to help identify general and detailed intentions of visitors and make better recommendations by the website’s recommender agent. This dynamic adaptation of the website offerings [2] could lead to an increase in the purchase incidence.

References


Effects of Product Recommendations on Customer Behavior in e-Commerce

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Abstract

We live in an age flooded with information from various sources. In e-Commerce, various efforts have been attempted to help efficient customer decision-making by suggesting the information and products users may like. E-Storefronts have expected to increase sales by cross-selling and improve customer royalty by reducing the search efforts of customers through the recommendations [8][11].

Product recommendations are generally executed by the phases that understand customers, deliver recommendations, and measure recommendation effect [1]. The phase of customer understanding is a step of collecting in-depth information about customers and building consumer preference profiles; the phase of delivery is the step that makes recommendations through algorithms and selects the items (products, advertisements, etc.) to be presented. This phase also presents the selected items to customers in diverse ways and places. The phase of measuring the recommendation effect is the step that provides feedback to the previous steps by assessing satisfaction to recommended products or by understanding how they can be used practically by customer. A large number of technical studies on product recommendations up until now have been focused on how to improve the algorithms used in the delivery phase [1][2]. Although the studies on the recommendation result based on customer behavior have not been carried out much as compared to technical studies, they have been performed in a form of behavioral study through surveys and experiments [3][9][10].

The empirical analysis and study on the change of browsing and purchase pattern of actual site users by recommendations are not common and the study on a change in the customer browsing pattern according to the difference in the recommendation level on a site has not been made previously. For the analysis of customer behavior according to the practical recommendation, it is necessary to study on a change in the browsing pattern through the analysis of clickstream data that is the actual visiting logs of customers. Since the browsing pattern between web pages and duration that has visited a site and products can be found through the clickstream data, various studies have been performed either to support the decision-making of customer by understanding the browsing behavior of customer within the site or to improve the browsing route of the site [4][5][6][7].

The principal objective of this research is to assess the effects of product recommendation on customer behavior in e-Commerce, using actual clickstream data. This study, instead of making a web site for the experiment, has analyzed the influence made on the attention, elaboration and purchase of recommended products by analyzing the clickstream data of the actual online bookstore. The target site for analysis is K (pseudonym) online bookstore and this study has compared the clickstream data of customer visit prior to the structural change of the site in the middle of the year 2006 with the clickstream data of customer visit after the site renovation. Although access to products through search and category still takes a large ratio, this can be considered as the cases for the product and information search of purpose-oriented customers. Followed by search and category, a large number of visits have been made on new products through sales promotion and product recommendation. Unlike search and category, the elements of information search and fun seem to be closely related to these pages.

This study could induce that more attention to the recommended products from customer can be garnered through the relevant product recommendation. The result of this study tells that the frequency of visits by clicking the related products has increased more after the site change than before the change. For the products visited by clicking the suggested product, customers have spent more time in information search after the change than before the change and the frequency of revisit has increased after the initial visit. The visit time and frequency of revisiting the product page could be regarded as the behavior of considering the product. The cases of putting the initially visited product through recommendation in the shopping cart after information gathering and revisiting have further increased and the cases that these products were included in the order transaction have not shown a difference before and after the structural change. While it has shown a significant difference in the phases of attention and elaboration, the cases of purchasing the products visited through a purpose-oriented route have taken more weight in the phases of decision-making and action like purchase. However, the ratio that the products visited through recommendation are included in the order
transaction has increased.

**Keywords:** Customer Behavior, Clickstream data, Product Recommendation, e-Commerce

**References**


Unified Data Access for Global Electronic Businesses

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Abstract

Databases are critical in managing business knowledge assets. SQL is the de facto way of accessing data because of its simplicity, which allows end users to get what they want effectively. However, as businesses become more globally and electronically interconnected, the need for automated data access increases accordingly and the simplicity of SQL quickly disappears. This is primarily due to the large number of competing technologies that facilitate automated data access, with factors including different programming languages, different database application programming interfaces, different database management systems, and different operating systems. In global businesses or extended networks of businesses, it is common to have many different competing and sometimes incompatible technologies working together at the same time. This research provides a new solution, a unified way to access data regardless of the underlying technologies. Therefore, businesses can save time and cost by focusing on getting the data they want, instead of focusing on how to get the data.

Keywords: unified database access, 1-to-1 SQL mapping paradigm, programming-language-independent, DBMS-independent, software development productivity.

1. Background

SQL, Structure Query Language, is the fundamental way of accessing data stored in a database [1]. The language is intuitive, so many users are able to learn the language quickly and put it to use immediately. However, to process a large number of business transactions or to analyze vast amounts of business data, automated data access is needed. Database application developers must write programs that can access databases to retrieve and store data. Typically, the process depends on the choice of programming languages, database application programming interfaces (API), database management systems (DBMSes), and operating systems. A global business is highly likely to have a mixture of different components at the same time, even within a single department, because new technologies are introduced and integrated while legacy systems are still being used and maintained.

Competing technologies exist at the same time because they have their own values and strengths. However, managing many different technologies at the same time is highly cost ineffective, and it can be a challenge to find developers who are familiar with all these different technologies. The problem is a well recognized one, as many researchers and commercial products are producing many solutions to this difficult problem. For example, different worthwhile efforts have been put into creating a unified database application programming interface (API), such as ODBC [2], JDBC [3], and ADO.NET [4]. Each was successful, yet none has become a clear winner. Part of the reason is that each API is highly tied to its host language, yet no database application developers or businesses as a whole use only one programming language. Consequently, many language-independent solutions have been produced, such as using middleware solutions or standardizing on XML [5] as the data exchange or storage standard. Yet these solutions do not offer the same space or time efficiency and convenience.

Since the early days of databases, SQL has been the standard language to query databases. In the domain of accessing data programmatically a single standard similar to SQL has never existed for very long. Researchers and practitioners by now probably believe that this will never happen, as evidenced by the popularity of middleware solutions as well as many researchers championing the idea that XML should be the only standard that should exist to solve the data access problem once and for all. Contrary to the common belief, this research provides a unified implementation that shows otherwise. Better yet, this research provides a breakthrough way of accessing data that is intuitive but its performance rivals or exceeds existing approaches.
Unlike previous attempts which were closed source, the author believes that publishing the source codes of this research (online at http://www.tudbc.org) allows businesses to have better control over how they want to access their data and customize it to fit their needs.

2. TUDBC: Truly Unified Database Connectivity

Truly Unified Database Connectivity (TUDBC) provides a single unified API for accessing data, regardless of programming languages, application programming interfaces (APIs), database management systems (DBMSes), and operating systems. In the past, each programming language required a unique style of coding for data access programming. Figure 1 shows an example of how TUDBC is used consistently across different programming languages. Figure 1 also highlights the consistency of TUDBC across different types of languages. This is particularly important for global businesses with multiple databases, because a single unified API saves on both the time and cost of learning, using and managing data access. Because the programming logic remains the same, businesses will have greater certainty that the programs will work correctly.

Two production-quality source codes are currently released on the website, including C# (and any other .NET languages such as VB.NET, F#, J#, etc.) and Java (another language widely used in businesses). Many other languages are actively being developed, including PHP (one of the most popular web application languages), Ruby (one of the newest programming language), C (one of the oldest programming language), C++ (one of the oldest object-oriented programming language), Perl, and Python. Keep in mind that any .NET programming languages (such as VB.NET, F#, J#, etc) can immediately use the C# library to begin using TUDBC. The coverage shows that TUDBC works for both the newer preferred object-oriented programming languages and the traditional procedural programming languages (such as C).
TUDBC is intuitive, as shown in the one-to-one mapping between SQL statements and TUDBC programming statements. The intuitiveness lets TUDBC achieve the same level of ease of use as SQL, which is not available in any past database APIs, middleware, or even XML. Past database APIs were usually more focused on a lower level of abstraction. For example, Figure 2 shows how one SQL statement translates into many programming statements, which loses one-to-one correspondence to the SQL statement. Furthermore, each language has significant differences that prevent developers from switching from one language to another easily. The implication for businesses is that business users can now focus more on business logic and getting the actual data, instead of being distracted by complex lines of codes about how to get the data. Furthermore, they are no longer tied to any particular database vendors, and they can freely choose the best performing vendors without changing source codes.

<table>
<thead>
<tr>
<th>One SQL Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSERT INTO STUDENT (NAME, AGE, GPA) VALUES ('John Doe', 19, 3.75);</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Many Programming Statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source Codes for Java with JDBC</td>
</tr>
<tr>
<td>PreparedStatement pst = connection.prepareStatement(&quot;INSERT INTO STUDENT (NAME, AGE, GPA) VALUES (?, ?, ?)&quot;);</td>
</tr>
<tr>
<td>pst.setString(1, &quot;John Doe&quot;);</td>
</tr>
<tr>
<td>pst.setInt(2, 19);</td>
</tr>
<tr>
<td>pst.setDouble(3, 3.75);</td>
</tr>
<tr>
<td>pst.execute();</td>
</tr>
<tr>
<td>Source Codes for C# with ADO.NET</td>
</tr>
<tr>
<td>SqlCommand cmd = new SqlCommand(&quot;INSERT INTO STUDENT (NAME, AGE, GPA) VALUES (@name, @age, @phone)&quot;, connection);</td>
</tr>
<tr>
<td>cmd.Parameters.AddWithValue(&quot;@name&quot;, SqlDbType.VarChar, 30);</td>
</tr>
<tr>
<td>cmd.Parameters.AddWithValue(&quot;@age&quot;, SqlDbType.SmallInt);</td>
</tr>
<tr>
<td>cmd.Parameters.AddWithValue(&quot;@phone&quot;, SqlDbType.Float);</td>
</tr>
<tr>
<td>cmd.Prepare();</td>
</tr>
<tr>
<td>cmd.Parameters[&quot;@name&quot;].Value = &quot;John Doe&quot;;</td>
</tr>
<tr>
<td>cmd.Parameters[&quot;@age&quot;].Value = 19;</td>
</tr>
<tr>
<td>cmd.Parameters[&quot;@phone&quot;].Value = 3.75;</td>
</tr>
<tr>
<td>cmd.ExecuteNonQuery();</td>
</tr>
</tbody>
</table>

Figure 2. Old APIs mapping one SQL statement to many programming statements.

Currently, TUDBC works with all top major database management systems, including Oracle, SQL Server, MySQL, and DB2. It also works with databases popular for small businesses such as Access and Derby. Many businesses have data in text files and Excel spreadsheets, and TUDBC offers the same consistent support for them as well. Because TUDBC source codes are published, users can extend TUDBC to support virtually any possible databases or they can wait for them to be included in the next release.

3. Performance

One of the common concerns with a unified solution is space and time efficiency, as evidenced in middleware solutions and XML. TUDBC has its own unique caching mechanism to cache both SQL statements and database connections. Therefore it is able to provide performance that is close-to-the-best or the best performance in various settings. Interested readers are referred to the website to read about the experiments in detail.

One significant feature of the performance enhancement is that it is hidden from developers. While developers still write programs in the same way, by simply using TUDBC they get built-in performance enhancement. This has significant implication for online businesses. Web applications usually demand high performance. Yet achieving high performance usually introduces a complex mechanism that is difficult to manage and debug. On the other hand, TUDBC provides performance without sacrificing intuitiveness or simplicity. Similarly, the performance
enhancement means that large amounts of data analysis can be done more quickly, which is particularly important for global businesses with large data warehouses and complex analytical needs.

4. Conclusion

TUDBC provides a unified solution for global businesses with complex database requirements for multiple platforms and high performance. TUDBC is intuitive because it corresponds directly to SQL statements, which allows database application developers to think and write programs more intuitively in terms of SQL statements. TUDBC has unified and consistent support for different programming languages, different database application programming interfaces, different database management systems, and different operating systems. Last but not least, TUDBC offers close-to-the-best or the best performance in various comparison settings. The implication of TUDBC is that global businesses can now better manage their data access by using TUDBC, which has the potential of improving productivity by increasing quality while saving time and cost.

References

A Comprehensive, Parsimonious, Process-Oriented Model for Web User Experience

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Abstract

Numerous attempts have been made to understand how consumers conceptualize their Web experience. Given the multidisciplinary nature of the Web, these efforts have led to “the blind man and the elephant effect.” For instance, because system designers view the Web as a collection of hardware and software, information systems theories and the corresponding metrics of Web user experience are dominated by a rather narrow (from consumers’ viewpoint) usability orientation. Marketers, in contrast, consider the Web as a branding and communications vehicle; yet their efforts are either devoted to advance atheoretical metrics [1] or are relatively narrow in scope, such as focusing on peak user experience (e.g., [2] [3]).

It is only recently that there has been an attempt to develop models that are grounded in broad, multidisciplinary theories (e.g., [4] [5]) that answer a fundamental question: How do users conceptualize, comprehend, interpret, or assign meaning to Web pages/sites? That is, how do users make sense of Web pages, and why do they react to them as they do?

We propose a comprehensive, yet parsimonious, meta model that transcends several narrower Web behavior models proposed in advertising, information systems, and marketing.

Because molar events cannot always be understood by their constituent parts alone, our model focuses on the perception at the molar (totality of user experience) and, not molecular level. With minor modifications, therefore, it applies to the perception of both Web pages and Web sites, a sign of its robustness and generalizability.

The Model

The fundamental premises of our model are: (1) the initial perception of a Web page/site involves understanding or making sense of the content and its organization on the page/site it (what is it, and what does it do for me?); (2) these early attention and interpretational processes of perceiving give rise to positive and negative affective reactions (or feelings 1), of which people are aware (i.e., they consciously monitor them) and which serve as causal antecedents that influence the evaluation of specific aspects of a Web page/site (e.g., attractive, lively, ugly), and its global evaluation (i.e., the overall attitude toward the Web page/site). The hypothesized model is presented in the attached Figure. Sample measures for the constructs are in Table.

In this context, it is worth noting that our model explicitly incorporates users’ feelings as causal antecedents to evaluations, attitudes, and behaviors. This is commensurate with the prevailing scientific view that affect is a highly organized, systematic response to environmental demands that has evolved to serve adaptive roles and that, to understand people’s judgments, we must understand their affective responses ([6] [7]).

Undergraduate students at a Midwestern university were the study participants. The product category selected was electronic cards. This is a relevant category for the students. The participants viewed a web page and responded to

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1 Affective responses, usually defined as valenced feeling states [8], run whole gamut from mild, transient, general, and pervasive moods to more intense emotions such as anger or fear. Appraisals, in contrast, are cognitive or evaluative responses or semantic judgments that represent a respondent’s praise or criticism of the characteristics of the target itself [9]. The two are qualitatively different; the latter is an appraisal, and the former is a phenomenological property of the person or a state engendered in the respondent [10].
questions related to the page and then navigated the underlying web site before responding to questions about the web site. Participants were asked to view the page and navigate the site as if they were casually browsing the web. Participants were told that they would fill out their reactions to the page and the site after viewing the home page and the site, respectively.

We tested the model on the Web page and Web Site using covariance structure modeling. Across two sets of home pages and web sites, the model is validated. The data confirm that, overall, the model presented in the Figure holds for the web page and web site. However, based on the nature of the stimulus—web page or web site—several differences emerge in the underlying constructs and the model.

**Implications**
Given the dizzying array of attributes designers have at their disposal (e.g., colors, font types, audio, video, and graphics) and their infinite possible arrangements on a page, the design of a Web page/site is a complex task and designers and marketers could use any help they can get. Our model complements extant usability and marketing methods and provides a reliable and valid means for securing large-scale user input in pre- as well as posttests. It, therefore, should facilitate marketing and design decisions by mapping users’ cognitive environment in terms of theoretically-anchored and reliably-measured constructs (e.g., coherence, richness, feelings, and shopping enjoyment).

**References**


Figure
A General Model of Web Page/Site Perception and Online Behavior

Table
Sample Measures for Constructs for responses to the Home page

<table>
<thead>
<tr>
<th>Construct</th>
<th>Sample Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding</td>
<td>It is easy to make send of this home page</td>
</tr>
<tr>
<td></td>
<td>Looking at this home page, I think the underlying web site will be easy to navigate</td>
</tr>
<tr>
<td></td>
<td>This home page is easy to comprehend</td>
</tr>
<tr>
<td>Involvement</td>
<td>This home page is professionally designed.</td>
</tr>
<tr>
<td></td>
<td>This home page lacks variety.</td>
</tr>
<tr>
<td></td>
<td>The web site this home page represents promises a lot of information.</td>
</tr>
<tr>
<td>Positive feelings</td>
<td>Did this Home page make you feel…</td>
</tr>
<tr>
<td></td>
<td>…joyous</td>
</tr>
<tr>
<td></td>
<td>…pleased</td>
</tr>
<tr>
<td>Negative feelings</td>
<td>…irritated</td>
</tr>
<tr>
<td></td>
<td>…annoyed</td>
</tr>
<tr>
<td>Evaluations</td>
<td>This Home page is …ugly</td>
</tr>
<tr>
<td></td>
<td>…attractive</td>
</tr>
<tr>
<td></td>
<td>…likeable</td>
</tr>
<tr>
<td>Attitude</td>
<td>What is your overall impression of this Home page…Appealing–unappealing</td>
</tr>
<tr>
<td></td>
<td>…good—bad</td>
</tr>
<tr>
<td></td>
<td>…favorable—unfavorable</td>
</tr>
<tr>
<td>Behavior Intent</td>
<td>What is the chance that you would further explore this Home page…</td>
</tr>
<tr>
<td></td>
<td>…likely – unlikely</td>
</tr>
<tr>
<td></td>
<td>…probable – improbable</td>
</tr>
<tr>
<td></td>
<td>…possible -- impossible</td>
</tr>
</tbody>
</table>
Where Have All the Trust Marks Gone?

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Abstract

In the early days of e-commerce and online retailing, trust was seen as a significant element required for developing online consumer buying intention and initial trustworthiness could be communicated through seals of approval or trust marks. Moving forward eight years has done little to change the issues that face online retailers and consumer perceptions. In fact, Jupiter Media Metrix reported that in 2006 over $24 billion worth of online sales was lost due to privacy and security concerns. This paper explores the current practice and utilization of trust marks by the top 100 online retailers to identify the connection and disconnection between business practice and theory.

Keywords: Trust, security, privacy, seals

1. Introduction

In the early days of e-commerce and online retailing, trust was seen as a significant element required for developing online consumer buying intention [1] [2] [3] [4] [5] [6] [7]. It was suggested that initial trustworthiness could be communicated through seals of approval and that these seals when posted on a company’s website could potentially boost consumer confidence and increase sales [8] [9] [10].

Moving forward eight years has done little to change the perceptions and issues that face online retailers. Individual shoppers are still concerned with online security issues as can be seen in comparing studies from 2004 and 2006 from Ipsos-Insight [11] and TNS [12] [13] in Table 1.

<table>
<thead>
<tr>
<th>Study</th>
<th>2004 Ipsos-Insight</th>
<th>2004 TNS Study</th>
<th>2006 TNS Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online credit card fraud a concern for online shoppers</td>
<td>69%</td>
<td>93%</td>
<td>86%</td>
</tr>
<tr>
<td>Important to have a trust mark of some kind</td>
<td></td>
<td>75%</td>
<td>42%</td>
</tr>
<tr>
<td>Only make purchase through sites with trust mark</td>
<td></td>
<td>80%</td>
<td>89%</td>
</tr>
<tr>
<td>Expect to see a trust mark on Home Page</td>
<td></td>
<td>64%</td>
<td>53%</td>
</tr>
</tbody>
</table>

The studies show consistency in the expectation and importance of trust marks although there was a reduction in those that will only make a purchase through a site with a trust mark. It is likely that this decline can be attributed to the fact that consumers are becoming comfortable with certain key retailers as 60% of consumers are buying mostly from the same sites [14] that already have a positive reputation. The potential lost revenue is significant with Jupiter Media Metrix reporting that in 2006 over $24 billion worth of online sales were lost due to privacy and security concerns.

More and more new trust marks continue to emerge in an attempt to address these consumer concerns. These trust marks include national marks such as the Austrian E-Commerce Trust Mark, e-Icon and many more which are spurned on with reports of sales increases of 5-15% when a trust mark is utilized [15]. This paper will explore the current practice and utilization of trust marks by the top online retailers to identify the connection and possible disconnect between business practice and theory.

2. Trusted Third Party Theory

There are many theoretical foundations for the use of online trust marks including brand management research where signalling theory in information economics [16] and brand alliances [17] are utilized. Brand alliances occur
when two or more brand names are presented jointly to the consumer [18], such as when a third party seal is placed in conjunction with a company’s website. These placements are especially important when a lack of knowledge about an online retailer inhibits the forming of trust [19]. If you do not have prior experience [20] with a website, then a transference of trust can be gained through information from a third party [21] until a point is reached when a reputation is developed for the online company. It has been suggested that even companies with a positive reputation from an offline presence that may carry over online [22] might still be able to benefit from trust marks [23]. More recent work by Pavlou et al. [24] identified that if consumers trust the signals that are presented to them, then fears can be alleviated.

3. Methodology

In order to evaluate the top retail oriented websites for their utilization of trust marks, the 2008 Internet Retailer Top 500 Guide was utilized [25]. Their Top 500 Guide generates a ranking of the top 500 e-commerce retailers from a variety of sources including web traffic scores from comScore Inc. and Nielsen Online. In addition to web traffic, web sales, visits and unique visitors, conversion rates and average ticket sales were utilized in calculating the top e-commerce retailers [25].

For the purposes of this paper, only the top 100 web retailer’s sites were utilized (some parent companies had multiple store sites) and each was visited and reviewed for trust marks between June 1st and June 30th, 2008. As the structure of each website differed, a protocol was established and followed to ensure consistency on the investigated pages. The main pages that a potential customer would visit in a normal transaction or if concerns were present were selected; Home Page, Privacy Page, and Security Page (if applicable). While it is acknowledged that additional trust marks may have been present on other pages such as the shopping cart close out area, it was decided not to investigate past the three pages previously identified. If a consumer has made it to these pages they have likely made the decision to purchase, so any third party influence would be negligible.

4. Findings

In reviewing the top 100 online retailers, a total of 145 unique company websites were visited. Of these a surprisingly high 47% of websites did not have a single trust mark present on their entire site and an additional 13% did not have a trust mark located on its Home Page. Despite the survey results indicating that almost 90% of consumers believed in the importance of a Home Page trust mark, 60% of the top 100 online retailers choose not to present one.

Table 2. Trust Mark Data Summary – Top 100 Online Retailers

<table>
<thead>
<tr>
<th>Top 25 Retailers (36 Sites)</th>
<th>% of Sites Without Any Trust Marks</th>
<th># of Different Trust Marks</th>
<th>% of Sites With Just 1 Trust Mark</th>
<th>Most Used Trust Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 26-50 Retailers (39 Sites)</td>
<td>52%</td>
<td>16</td>
<td>10%</td>
<td>BBB Reliability</td>
</tr>
<tr>
<td>Top 51-75 Retailers (37 Sites)</td>
<td>41%</td>
<td>14</td>
<td>32%</td>
<td>Hacker Safe</td>
</tr>
<tr>
<td>Top 76-100 Retailers (33 Sites)</td>
<td>36%</td>
<td>25</td>
<td>21%</td>
<td>BBB Reliability</td>
</tr>
<tr>
<td>ALL TOP 100 Retailers (145 Sites)</td>
<td>47%</td>
<td>32</td>
<td>22%</td>
<td>VeriSign Secured</td>
</tr>
</tbody>
</table>

Table 2 presents a brief summary of just a few of the key findings on the utilization of trust marks by the top 100 retailers. The results indicates that the utilization of trust marks increases as you move further down the list to less popular websites. This is consistent with the literature discussed earlier as an appropriate practice when a reputation has not yet established [i.e. 20] [21]. It would appear however that many companies are still struggling with uncertainty around trust marks with 32 different trust marks being used in only 145 websites, in fact, of the 42
parent companies with more than one website, a surprising 43% have different seals on the web pages of their different companies.

5. Conclusions and Recommendations

The literature would suggest that trust marks should increase online consumers’ trust and willingness to make purchases online, and this appears to be implemented in practice. The importance of trust marks is unlikely to decline as shown by Bricker [26] who stated that “The future will be dominated by competition for public trust. People are increasingly turning to ‘trust marks’ to sort through the cluttered information economy marketplace”. The question still remains however, what do trust marks mean for the customers, what works best and are customers able to differentiate between marks that address different concerns such as security (Hacker Safe), credibility (BBB Reliability) and privacy (Truste).

References


Online Privacy and Security Concerns of Senior Citizens: An Empirical Study

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Abstract

Consumers from all strata of society are increasingly participating in online interactions as a means for communicating and conducting transactions. Internet privacy and security is emerging as a major concern for consumers with the rise in identity thefts, money scams, e-mail phishing scams and key-logging. Phishing refers to a relatively new technique where criminals send emails pretending to be from a well-known source (for example, a bank) and ask the recipient to provide their personal information for verification purposes. In 2006 alone, there was 150% increase in computer intrusion related suspicious activities from previous year [2]. Spam accounts for 60-85% of all email [1]. In 2006, online fraud cost $200 million to Americans, and cybercrime cost businesses above $67 billion, not counting the indirect costs such as higher retail prices and banking fees and lowered tax revenues [1]. This study aims to conduct a comprehensive study of senior citizen consumers to understand their concerns, intentions, and behavior towards information privacy and security in the context of online interactions.

Internet is being used by population for a variety of daily activities. In 2006, eighty percent (80%) of American internet users, about 113 million adults, used online health or medical information1. Among older US citizens, in 2007, 15% of those in age 65 and older group, and 40% of those in ages of 50 and 64 had home broadband high-speed connections2. Another recent report found that about 15% of Americans in their mid-60s do not have a cell phone or internet access3. Older adults also face a number of hardships online:

- Lack of bigger fonts
- Difficulty with input devices requiring fine motor control such as mouse control, small keyboards
- Sites with large number of navigation links can be taxing on spatial memory while browsing and searching

As Internet use among senior citizens continues to increase, so does their vulnerability to Internet-related fraud. Older people in age 64 or older are generally less careful in their offline security such as regularly checking their financial statements. As a newly emerging issue, statistics and research on the topic are limited. What we do know is that seniors fear fraud more than health crises and terrorism4 and that the number of seniors 65+ who are online continues to increase and is now about 34% of the senior population.5 A recent Internet Crime Complaint Center (IC3) report6 on Internet Crimes stated that:

- California ranked first among all states with the highest number of individuals reporting Internet-related crimes.
- In California, nearly 10% of crimes were reported by individuals in the age group of 60+.
- Electronic mail and web pages were the two primary mechanisms of fraudulent contacts.
- The most commonly reported Internet-related scam among senior consumers (60+) involved phishing (21%).

Since online information privacy and security concerns are inextricably linked, well-grounded research to understand consumers’ privacy and security risk beliefs is an important precursor to developing appropriate policies to help consumers during online interactions. Information security and privacy are often used synonymously, but are two distinct concepts. Privacy refers to the right of a person to control his or her own personal information [5] whereas security refers to the ability of the owner of the information to keep it secure by protecting it from unauthorized access. Thus, “information is secure if the owner of information can control that information. Information is private if the subject of information can control that information.” [3, p. 150].

1 http://www.pewinternet.org/pdfs/PIP_Online_Health_2006.pdf
2 http://www.pewinternet.org/press_release.asp?r=141
3 http://www.pewinternet.org/pdfs/PIP_ICT_Typology.pdf
5 http://www.pewinternet.org/pdfs/PIP_Wired_Senior_2006_Memo.pdf
Research Methodology
Based on extensive literature review, we note that there is a crucial gap in the available body of research in this area. This study is based on the social sciences framework utilizing the Theory of Reasoned Action [4] and provides the foundation for this study to examine our research questions in the context of senior consumers’ online privacy and security concerns.

![Diagram of Theory of Reasoned Action]

This widely accepted theory identifies external factors affecting belief formation. Beliefs influence an individual’s overall attitudes, which then guide their intention to do something in a specific context. Another factor affecting intention is subjective norm. Subjective norm is the influence of social pressure that as perceived by the individual. An individual will intend to perform a certain behavior when he/she perceives that someone important to them thinks he/she should perform or not perform a certain behavior. For example, a consumer might be favorable to sharing their personal information online; however, their intention might be affected if someone important to them thinks that he/she should not share their personal information. Finally, intentions affect actual behaviors.

Survey based on research model in Figure 1 collects data on senior citizens’ online risk beliefs and intentions towards sharing information online and their actual online behavior. Results of this study would yield the following:
- Understanding of how senior citizens are utilizing the Internet
- Robust understanding of online vulnerabilities of the seniors
- Identification of factors that might influence a change in their online behavior to better protect themselves against Internet fraud.

This study serves as the basis for developing:
- Collaboration with community agencies on educating senior consumers to be more aware and protective of their information while conducting online transactions, and
- Strategies for businesses to formulate policies that will enhance senior consumer’s trust.

Keywords: Online Privacy, Online Security, Theory of Reasoned Action, Senior Citizens

References

What Factors Influence Bloggers’ Information Privacy Concerns?

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Abstract

Since emergence, Web 2.0 applications have been widely adopted at a surprising speed. Among them, Weblog, or called blog, is a web-based application that uses a variety of tools to facilitate self-description and interaction with others. People use blogs for various reasons. However, about 70% of bloggers use it as an on-line diary [4]. While in the old days people lock their diaries secretly from their family and close friends, today many are willing to share their life stories, sometimes very sensitive, to a stranger.

Many research have significantly contributed to our understanding on the issue that providing information privacy protection is believed to be a critical success factor of electronic commerce [1]. However, little research was done to explore the privacy concerns in the context of Web 2.0 applications. Also, it is dangerous to directly apply the findings on e-commerce to the use of blogs since blogs and e-commerce have fundamental differences in term of users’ motivations. Therefore, it is necessary for us to conduct a new research. Our focus here is on the diary-like blogs and aims to identify important interpersonal and technological factors that impact bloggers’ information privacy concerns.

This study focuses on two folds. First, following the Social Network Theory [3] we examine bloggers’ concerns on information privacy from the perspective of strong ties and weak ties. In this perspective, information redundancy and relational embeddedness are two key factors to distinct the strength of a tie. Here, we adopt the multi-dimensional construct IUIPC (Internet Users’ Information Privacy Concerns) [5], which consists three dimensions, i.e. collection, control and awareness, to measure information privacy concerns. We test the relationships between tie strength and privacy concerns for two types of information, namely static information and dynamic information.

Second, we look into the role of technology control in moderating the effects of tie strength on bloggers’ information privacy concerns. Based on Self-Determination theory [2], we classify technology control into two types: internal control and external control. The internal control guarantees bloggers’ autonomy on how and what they want to post in their blogs while the external control ensures a blogger to decide whom has the right to access his/her blogs. Our model will be tested with empirical data. A pilot study will be conducted to assess the measurement development. We will then seek for a partnership with an existing blog website for data collection to promote an online survey. We will try to minimize the common method bias by using both procedural and statistical remedies [6].

It is hoped that this study can have early contribution to the discussion on information privacy issue of Web 2.0 applications. We expect to identify important determinants that influence bloggers’ information privacy concerns and we believe the result will generate practically useful implications.

Keywords: Information Privacy Concerns, web 2.0, strength of ties

References

Information Systems Security and Web 2.0: 
The Security Challenges of Social Networking

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Abstract

Now more than ever, the old business adage “it’s not what you know, but who you know” has currency. Social networking has revolutionized the way we communicate and share information in the 21st Century. It has also significantly shaped the development of how businesses have attempted to take advantage of the global electronic business marketplace. According to ComScore Media Metrix, there are over 506 million people worldwide that are using social networking sites on a regular basis [4], and it now seems that social networking is a part of everyday life and business. Most social networking services provide a collection of various ways for users to interact and share information. The main types of social networking services are those which contain directories of some categories (such as former classmates), means to connect with friends (usually with self-description pages), and recommender systems linked to trust. The most popular sites in North America are MySpace, Facebook, LinkedIn and Windows Live Spaces [7].

Technically, social networking is part of an explosion of reach and participation in collaborative, pervasive, richly featured communication technologies, commonly referred to as Web 2.0. In this regard, social networking is of increasing importance to global business practices. Not only do businesses use social networking to screen and monitor employees, but it is also a mechanism by which global electronic business transactions take place and how business partners or even employees are found and often screened. In some cases, social networking is how business processes are conducted and companies actually monitor the linkages and how they are formed. Social networking is also seen to be an important element of knowledge management that is increasing in interest among researchers [3].

Importantly, researchers have focused on knowledge creation, acquisition, and sharing but very little on securing knowledge [8]. Protection of knowledge, though an essential business function, has received little attention in the literature and has been identified as a key gap [6] [2] [8]. Asllani and Luthans (2003) surveyed 307 knowledge managers about their roles and found little or no evidence of security issues in their jobs [1]. In this context, even less research has been conducted in the area of the security of social networking. As with all technology solutions in business, their impact on security is essential for strategic operations in the digital global business environment. Therefore, understanding the current status of security in key social networking sites provides an important contribution to practice as well as a methodological baseline for investigating security issues in these types of Web 2.0 applications.

The goal of this research was to identify whether there were any security issues related to Facebook, MySpace, LinkedIn and Windows Live Spaces and to develop a methodology for analyzing the security of similar Web 2.0 technologies so that this methodology can be more specifically applied to businesses. The results provide firms with practical security considerations in incorporating social networking into their business practice. The methodology provides academics with a tool for assessment for similar technologies as well as a point of departure in analyzing social networking security.

This study demonstrates that security is a very real issue in all of the social networking sites. However, our data indicate that there is variation in the degree of the problem. In addition, this study provides a methodology that can be used in businesses to establish better security and security policies for social networking and knowledge management systems which leverage Web 2.0 technologies. Finally, this study contributes to the academic community by developing a framework for examining security issues in the context of Web 2.0 technologies.

Keywords: Social networking, security, Web 2.0
References
The Institutional Environment for Global E-commerce Diffusion:  
A Cross-country Investigation

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Abstract

Grounding on institutional theory and e-commerce adoption literatures, the study conducts a cross-country analysis assessing the effects of industrial, governmental and legal factors on global B2B e-commerce diffusion in the years of 2001-02 and 2006-07. The analysis is based on a secondary dataset from the Global Information Technology Report published by the World Economic Forum (WEF). The secondary data analyses cover 75 countries in 2001-02 and 122 countries in 2006-07, reflecting business perceptions of the institutional environments and e-commerce diffusions in those countries. The results of the study indicate that at the infant stage of e-commerce, the supportive government policy was a powerful facilitator for e-commerce diffusion around the world. As e-commerce becomes more prevalent, e-commerce diffusion is more business-driven and the government policy loses its significance. Meanwhile, as companies engage more in e-commerce, the legal environment becomes an important factor in e-commerce diffusion. The study confirms various institutional environments exert influences on countries’ e-commerce diffusion at various stages of e-commerce development. It is one of the first cross-country studies on the institutional environments and the research results have managerial and policy implications for global e-commerce diffusion.

Keywords: Institutional environment, B2B e-commerce diffusion, industrial factor, governmental factor, legal factor

1. Introduction

E-commerce has become a pervasive business phenomenon in the information society. By making business more competitive and productive, e-commerce is momentous for both developed and developing countries in strengthening the economy and supporting the development. The reality is that, however, after a decade of development, e-commerce diffusion among different countries is still uneven due partially to different external environment. The challenge is thereby for researchers, industry practitioners and policy-makers to better understand the e-commerce phenomenon and to ensure that the opportunity and potential offered by e-commerce is taken and realized in all economies. In particular, e-commerce should be facilitated, not inhibited, by its external environment.

While IS (information systems) researchers have given much attention to IT diffusion in general, many research questions were left still unanswered. In particular, the topic of whether and how the external environment could significantly define the information ecosystems of organizations has been identified in the last two decades as an area with the rarest study but meriting research attention [1] [25] [30] [32] [40]. It is an object of this study to provide a comprehensive and institutional lens for understanding the external environment of e-commerce diffusion in different countries. Accordingly, the study concerns the relationship between institutional environment and global e-commerce diffusion and investigates the impact and effect of those institutional factors. The study aims to answer two specific research questions as follows.

1) What are the primary components of the institutional environment required for e-commerce diffusion? and
2) Whether and to what extent do those institutional factors influence e-commerce diffusion in different countries?

2. Research Background

2.1 Definition of E-commerce

While several definitions of e-commerce have been developed and used in different contexts and for varying purposes, e-commerce is defined in this study as any commercial process that is conducted over Internet-based computer networks. In this definition, the term “commercial process” means all activities that generate value from inbound logistics to outbound logistics and marketing/sales, with external business partners, such as suppliers and customers. It ranges from providing and obtaining product or service information using email and website to receiving and placing orders over the Internet. From this perspective, e-commerce is synonymous with e-business, but focuses more
on external business processes. An assumption here is that companies’ external business processes would be
influenced by the external environment more than its internal business processes would be.

Furthermore, this study narrows down the scope of e-commerce in question to business-to-business (B2B), which is
between trading partners rather than between business entity and individual consumer (B2C). B2B e-commerce
constitutes from 75% to more than 90% of all e-commerce activities in different countries [46] [59] [60]. It plays
undoubtedly a pivotal role in e-commerce.

2.2 Uneven Diffusion of E-commerce

Even with considerable opportunities offered by e-commerce, the diffusion of e-commerce is varied largely among
different countries and economies. There has been a concern that uneven diffusion of e-commerce would create unfair
competitive advantages for multinational oligarchs against local SMEs and create a “digital divide” between
developed and developing countries. Countries that lag behind in e-commerce and other technological innovations
will risk being bypassed by the competitive edge of those using the new technologies [58]. In a worse scenario,
existing socio-economic divisions between developed and developing countries would be reinforced by the “digital
divide”, rather than be narrowed or changed by e-commerce.

2.3 Policy of E-commerce

For the facts shown above, e-commerce has been both a strategic initiative of private sectors and a key policy issue of
public institutions. Many disparate guidelines, directives, laws, and treaties have emerged and governments around
the world have developed bold plans for boosting e-commerce. These institutional activities, in turn, created and
shaped the external environment for firms’ e-commerce adoption decision, although the degree of their effects might
be varied across countries.

Despite the numerous endeavors, governments should proceed carefully to construct policies to enable and promote
e-commerce, with consideration of the institutional capacities of a country. How to create a supportive environment
for e-commerce diffusion has driven much of the debate on policy making since the end of 1990s. One of the
responses was a Framework for Global Electronic Commerce proposed by the U.S. government in 1997. The
Framework recognized that governments could have a profound effect on e-commerce, either facilitating or inhibiting
it. Knowing when and how the government should act is crucial to the development of e-commerce.

It is commonly believed that the private sector makes its business and management decisions in an integrated
institutional context covering laws, regulations, standards, norms, funding and promotions. It is also believed that
policy-making has an original motivation to promote e-commerce adoption. However, how the policy plays and how
it should play the role as a promoter in the private sector’s decision on e-commerce is still unclear. One of the reasons
is that, in an increasingly complex information economy, it is difficult to identify and measure the effect of policy
outcomes. To conclude, both the significance and challenge of e-commerce are so obvious that there is an imminent
need to evaluate scientifically the effects of institutional factors on e-commerce diffusion for reference in appropriate
policy-making and business decision.

3. Theoretical Foundation

Adoption and diffusion of e-commerce has been a growing topic of academic research as well. One of the research
approaches is employing institutional theory to study the external environment for e-commerce diffusion. “Insights
from the New Institutional Economics suggest that we should look beyond those proximate indicators [i.e. physical
infrastructure] to examine how the institutional environment in a country contributes to (or undermines) confidence in
e-commerce and supports private investment in the new medium [of business transaction].” [42] This study follows
this theoretical suggestion to conduct a series of empirical studies on the institutional environment factors for global
e-commerce diffusion. The theoretical underpinnings in this section provide the rationale and relevance of using
institutional theory in the study.

The meaning of the term “institution” is twofold. First, institutional theory traditionally views institutions as a
framework “of rules, procedures, and arrangements” [51], or “prescriptions about which actions are required,
prohibited, or permitted” [41]. Second, institution could be labeled as social organizations including legislatures,
government agencies, trade unions, and firms [2]. These two definitions are related to each other. The latter formal
organizations create and shape the former normative rules in the society and those rules and arrangements influence the decision and behavior of organizations in the society. New institutionalism attempts to answer how social choices are shaped, mediated, and channeled by institutional arrangements, since social choices are generally not free from institutions, social norms, or legal procedures [13].

Within IS research, scholars suggested that organizational change with respect to the use of information technology could be profitably analyzed drawing on socio-economic and political (i.e., external contextual) levels of analysis [44]. The theoretical assumption here is that organizational decision is based on differential perception and understanding of the institutional environment context. Furthermore, pioneer researchers Ives, Hamilton and Davis included external environment in their proposed MIS research model. This environment included industrial, political, legal, economic and social environments within which organizations were embedded [25]. Applied specifically to e-commerce diffusion, the institutionalism lays an important theoretical foundation for conducting study on external environments for organizations to make e-commerce adoption decisions. Institutional theory guides the reasoning through the research question to a number of more specific variables and hypotheses in the study.

4. Institutional Approach and Research Model

Since the publication of DiMaggio and Powell’s book “The New Institutionalism in Organizational Analysis” in 1991, the institutional approach has attracted more and more attention of IS researchers. King et al. in their profound paper in the journal of ISR (Information Systems Research) defined institutions as “any standing social entity that exerts influence and regulation over other social entities” [30]. They further argued that the relationship between environmental factors and e-commerce diffusion could be explained using institutional theory. Later in a cross-country study of e-commerce, the industrial, governmental and legal factors were analyzed as the institutional environment for e-commerce [42]. In that study, the institutional environment was defined as the “set of fundamental political, social and legal ground rules that establish the basis for production, exchange and distribution” [42]. In the context of e-commerce, this institutional environment consisted of suppliers, customers, competitors, trading partners, society, and regulatory agencies such as government [20].

Applying the above conceptual arguments, together with the theoretical foundations described in the previous section, the research model of this study is constructed and shown in Figure 1. The model conceptualizes the expected directional relationships between B2B e-commerce diffusion and three major factors of the institutional environment—industrial environment, governmental policy, and legal environment. The posited relationships controlled for the effect of GDP per capita in each country. The research model did not mean to capture exhaustively all possible factors in e-commerce diffusion, but to illustrate how some of the important environmental factors affected global e-commerce diffusion.

![Institutional environment](image)

**Figure 1. Research model of the institutional environment for B2B e-commerce diffusion**

This research model visualized the predictive variables of e-commerce diffusion and underlying logic inferred from the institutional theory. The later data collection and analyses would focus on the industrial, governmental and legal factors as a major source of “institutional environment” [54]. The causal model also helped specify three research hypotheses in the study. As discussed in the next section, each construct in my research model was tested by previous empirical studies more or less. Yet no research has ever investigated the three external factors collectively in a single research model.

5. Literature Review and Research Hypotheses
5.1 Industrial environment

The industry within which an organization operated might be instrumental in determining the degree to which an organization participated in B2B e-commerce [54]. A recent study of SMEs in Denmark, Germany, France and the U.S. found that important drivers for e-commerce diffusion in those countries were the use of e-commerce by major competitors, customer’s demand, and supplier’s requirement [4]. The European Commission’s e-Business Survey 2006 found that four main reasons for companies to start e-commerce were: “because competitors use it”, “to gain competitive advantage”, “to fulfill customers’ expectations”, and “to fulfill suppliers’ expectations”, which in summary represented the competition pressure and market demand [17]. There were numerous studies on the industrial factor in the last decade. Several dimensions of industrial environment identified in my literature review are discussed as follows.

5.1.1 Competitive Intensity

Competitive intensity has been investigated more than any other external factors in e-commerce adoption literature. In early studies on inter-organizational information systems, competitive intensity was found as the most important external factor in EDI adoption in the U.S. [45] [47], SMEs in Canada [8], and firms in Taiwan [61]. After almost a decade, competitive intensity was still a significant factor affecting the decision to adopt e-commerce in the U.S. [56] [62] and Taiwan [35]. A research stream initiated by Gibbs et al. in 2003 first used case study to show that competitive intensity would be the greatest driver of global e-commerce diffusion [19]. They then showed that competitive intensity significantly affected the intent to adopt e-business, using a large-scale survey of 3,100 businesses in eight European countries [65]. A follow-up survey with firms in ten countries further confirmed that competition intensity was an important factor affecting the sophistication of e-business adoption [67]. In studies within several specific countries, competitive intensity was found as one of the primary reasons to adopt e-commerce. Those countries included developed countries such as UK [10] [55] and South Korea [26], and developing countries such as Thailand [34], Chile [21] and Brunei [36].

5.1.2 Impacts of Customers/suppliers

In their widely-cited case study, Iacovou et al. posited that the trading partner’s imposition was one of the most critical factors for SMEs’ adoption of EDI [24]. In a recent case study, Ng also found the influence from trading partners in the choice of B2B e-commerce model [18]. Those trading partners could be a dominant customer (or supplier) pushing its suppliers (or customers) to implement relationship-specific information systems such as EDI and SCM [16] [53]. SMEs participated in an APEC’s (Asia Pacific Economic Cooperation) e-commerce survey ranked “low use of e-commerce by customers and suppliers” as No.1 perceived barriers to e-commerce adoption [46]. Until sufficient numbers of their main customers and suppliers participated in e-commerce activities, there was little incentive for those SMEs to become engaged in e-commerce themselves.

5.1.3 E-commerce Diffusion in the Industry

At theoretical level, Rogers indicated that potential adopters of innovation would look to early adopters for experience, advice and support [48]. Leading and innovative companies have recognized that they need to get other firms that haven’t adopted e-commerce “on board” in order to reap the full benefits of e-commerce [17]. A case study on Taiwan’s IT industry found similar industrial forces as well as rules and standards established by local industry drove B2B e-commerce diffusion [6].

From the theoretical perspective, business organizations operate in an industrial environment consisting of other business entities. They exert influences on each other. In order to survive, organizations must conform to the rules, standards, requests and trends prevailing in this industrial environment. As a result, an institutional isomorphism would be formed in that industry. In other words, competitors, customers, suppliers and peers could create a strong “bandwagon” effect that influences firms in that industry to adopt e-commerce [7] [22] [57]. Drawing on the theoretical arguments and the findings from previous research, this study hypothesized that the industrial environment had a positive influence on e-commerce diffusion, as follows:

H1. The more supportive is the industrial environment for e-commerce in that country, the more extensive is the e-commerce diffusion in that country.

5.2 Government Policy
In early empirical studies, Iacovou et al. found that the promotional efforts of government could lead to faster adoption of EDI in Canada [24]. Dasgupta et al. found that government policy was an important determinant of IT adoption in India [11]. After a longitudinal study over 16 years, Wang concluded that building national IT infrastructure was a primary government policy choice supporting IT adoption in newly industrialized economies [61].

When asked to identified measures to encourage wider adoption and use of e-commerce, SMEs in the APEC region ranked highly the government actions in improving telecom infrastructure, imposing fair tax policy for online transactions, developing national e-commerce strategy, enhancing government e-commerce use, providing e-commerce training, and promoting e-commerce use [46]. Similarly in a qualitative interview with SMEs in southern Italy, interviewees indicated that governmental campaign, financial incentives and tax breaks were important external factors affecting their adoption of B2B e-commerce [49].

Governmental policy positively affected the likelihood of EDI adoption in Hong Kong [5] [33]. Governmental promotions and supportive policies were significantly related to e-commerce decision in China [9] and the extent of e-commerce adoption in Pakistan [50]. On the other hand, lack of governmental support was an important barrier of e-commerce adoption in Oman [29].

Governmental support could also be realized through its own adoption of e-commerce and thus being the role model for the private sectors. Although there were fewer governmental incentives in the U.S. than in other countries, government procurement using e-commerce model was a relatively important driver for US firms to adopt e-commerce [18]. Fifty interviewed companies in less technologically advanced countries in southeastern Europe perceived e-government application as a form of e-commerce promotion from the government [43].

Oxley et al. indicated that governments played a critical role in creating the institutional environment that fostered private investment [42]. Governmental context thus became essential when B2B e-commerce adoption was considered as a company’s investment in IT. Government policies should leverage and facilitate but not stifle e-commerce adoption in private sector. Gibbs et al. argued that governmental promotions and incentives were a major enabler of e-commerce and that national policies for IT infrastructure, such as trade and telecommunication liberalization, were also likely to have big impact on e-commerce diffusion by making IT more affordable to firms [19]. Government’s important role in supporting e-commerce adoption in private sectors has been referred to as leader, promoter, facilitator, regulator, educator and financier [46]. Mann further posited that the slowness or failure of e-commerce adoption in some developing countries were the consequence of policy inaction or wrong action by their governments [37]. Drawing on the theoretical arguments and previous research findings, this study hypothesized that the government policy would have a positive impact on B2B e-commerce diffusion, as follows:

\[ H2. \text{The more supportive is the government policy for e-commerce in that country, the more extensive is the e-commerce diffusion in that country.} \]

5.3 Legal Environment

Several international studies using secondary data found that the legal environment in a country affected e-commerce activities and revenues in that country significantly [38] [42] [64]. A group of cross-country survey studies also showed that legal environment was significantly important to determine both the breadth and depth of e-business adoption and drive the e-business value, especially in developing countries and newly industrialized economies [20] [63] [66] [67] [68]. An earlier study of e-commerce diffusion in the APEC region further specified that a legal framework supporting e-commerce was important for reducing uncertainties and building trust and confidence in the electronic marketplace [46].

Lack of regulations and legislations and legal inadequacy for e-commerce practice were a major barrier and/or serious limitation to e-commerce diffusion in the APEC region, UK, Turkey, and Oman [28] [29] [46] [55]. In the countries without new principles regulating rights and obligations in the intangible cyberspace, e-commerce diffusion seemed to be slow [52]. For example, compared with firms in the U.S., fewer Chinese firms adopted e-commerce because of the less friendly legal environment. By contrast, the US legal environment was more supportive to e-commerce than in other countries; it led to a higher percentage of US firms used e-commerce. A related study confirmed that the U.S. did have a better legal environment supporting e-commerce use than other countries and that US companies expressed less legal concerns when doing e-commerce [23]. On the other hand, APEC’s study on e-commerce diffusion found that
firms in lower GDP countries appeared to be more concerned about legal issues than similar firms in higher GDP countries [46]. This concern might be due, in part, to a relative lack of adequate legal infrastructure for e-commerce in those lower GDP countries.

The legal consideration was the root of traditional institutional theory. Institutions were first the legal ground rules and procedures. Institutional influences were hence political in nature as when organizations must conform to laws and regulations to earn the organizational legitimacy [14] [39]. On the other hand, the legal institution should provide predictable, credible, coherent and adaptable rules for economic transactions. Accordingly, new institutionalism believed that the legal environment could reduce organizational uncertainty by providing adequate, clear and efficient frameworks for economic change [39]. Drawing on both empirical and theoretical assertions, this study hypothesized that a supportive legal environment could have a positive impact on e-commerce diffusion, as follows:

\[ H3. \] The more supportive is the legal environment for e-commerce in that country, the more extensive is the e-commerce diffusion in that country.

6. Research Methodology

6.1 Use of Secondary Data

This study used secondary data collected by an international institution to study e-commerce diffusion across a large number of countries and at two time points. Based on a series of secondary data analyses, the institutional theory in e-commerce diffusion and its related hypotheses were tested. The results served as an empirical evidence basis for policy and managerial implications.

6.2 Multi-time Points Approach

Unlike most cross-sectional analyses that took place at a single point in time, this study involved a series of data collections and analyses at multiple points in time, which could be categorized as a time series design [27]. Phase-1 of the data collection was in the year of 2001-2002. It represented the early stage of B2B e-commerce diffusion—private sectors began to use the new business model and governments around the world began to take e-commerce into account in formatting economic policies. Phase-2 of the data collection was in the year of 2006-2007. The data represented a snapshot of the latest development of B2B e-commerce. The investigation repeated the secondary analysis to test the same hypotheses as in Phase-1. It was particularly important and interesting to see whether there were different effects of external environment on e-commerce diffusion at its infant stage and when e-commerce model was becoming prevalent. From a longitudinal perspective, this temporal approach to observe change of those institutional influences over time provided a better basis for causal inference than a single cross-sectional study did [27]. It also enhanced the comprehension and explanation of the institutional circumstances that affected B2B e-commerce diffusion.

6.3 Sample

6.3.1 Phase-1 (2001-2002)

Samples in this study consisted of countries of which secondary data were available from a well-respected international institution—Switzerland-based World Economic Forum (WEF). The WEF launched its first Global Information Technology Report (GITR) in 2001. Since then, the GITR has been published annually and provides a yearly snapshot of networked readiness in countries [15]. The GITR collects and compiles country networked readiness indices that assess both the environment for IT offered by a country and usage of IT among the country’s business. It enables comparisons of network environments among states on a quantitative basis. To conduct the secondary data analysis in Phase-1, this study used the GITR 2001-2002 and there were 75 countries in the sample. These 75 countries accounted for more than 80% of the world’s population and more than 90% of its economic output [31].

6.3.2 Phase-2 (2006-2007)

In Phase-2, this study looked into the latest available secondary data from the WEF—the GITR 2006-07. For the secondary data analysis in Phase-2, the sample size was 122—75 countries from Phase-1 and 47 additional countries. The samples in both phases represented exhaustive sets of countries for which reliable institutional environment data
and e-commerce data were available at the time of data collection.

6.4 Variable List

6.4.1 Phase-1 (2001-2002)

Measurements for two independent variables (IVs) associated with the research model were available in the WEF’s GITR 2001-2002. First, the IV of legal environment was measured by one item of “legal framework supporting IT business” in the GITR. The item represented an assessment of how supportive of the legal framework in each country for the development of online businesses. Second, the IV of government policy was drawn upon three items in the GITR. It was an arithmetic mean of the underlying three items shown below. The Cronbach’s alpha for the three items measuring the government construct was 0.812.

\[
\text{Government policy} = \frac{1}{3} \text{Government priority} + \frac{1}{3} \text{Government promotion} + \frac{1}{3} \text{Government-business transaction}
\]

As for the dependent variable (DV) of e-commerce diffusion, two items of e-commerce index in the GITR were employed. “B2B e-commerce transactions” represented an assessment of how the companies in a country interacted with their suppliers over the Internet; “Sophistication of online marketing” measured the advancement of online marketing used by the companies in that country. The DV was an aggregation of these two items based on the following weighted combination. The Cronbach’s alpha for these two items was 0.946.

\[
\text{B2B e-commerce diffusion} = \frac{2}{3} \text{B2B e-commerce transactions} + \frac{1}{3} \text{Sophistication of online marketing}
\]

E-commerce adoption, as well as legal and policy environments, are commonly believed to correlate significantly with the level of economic development in a country [42]. It is important to control for this aspect of country difference. Therefore, the GDP per capita in each country was used as the control variable.

6.4.2 Phase-2 (2006-2007)

In the WEF’s GITR 2006-2007, three new items were available to measure the IV of industrial environment in the research model—local competition intensity, local supplier quality related to technology, and firm-level technology absorption. The IV was an aggregation of these three items using the following formula. The Cronbach’s alpha for the three items measuring the industrial construct was 0.924.

\[
\text{Industrial environment} = \frac{1}{3} \text{Competition intensity} + \frac{1}{3} \text{Local supplier quality} + \frac{1}{3} \text{Firm-level technology absorption}
\]

Three items to measure the IV of government policy had been revised in the GITR 2006-07 as shown in the following formula (Cronbach’s alpha = 0.958).

\[
\text{Government policy} = \frac{1}{3} \text{Government priority} + \frac{1}{3} \text{Government vision} + \frac{1}{3} \text{Government promotion}
\]

Another IV of legal environment was still measured by one item of “laws relating to ICT”, which assessed how developed and enforced was laws relating to the use of IT in a country. The DV of e-commerce diffusion was represented by a single item in the GITR 2006-07, “extent of business Internet uses”. It measured in each country the companies’ use of the Internet for buying/selling goods and services and for interaction with customers. The relationship between three IVs and the DV was again controlled for the GDP per capita in each country.

7. Data Analyses and Results

7.1 Phase-1 (2001-2002)

Multiple regression was used to test the research model. The regression equation was specified as follows.

\[
\text{E-commerce diffusion} = b_1 \text{Legal environment} + b_2 \text{Government policy} + b_3 \text{GDP per capita} + c + e
\]

A multiple regression was run on SPSS 16.0 to first test the additional regression assumptions, such as no multivariate outliers, no nonlinearity or heteroscedasticity, normality of the residuals, no multicollinearity, normal distribution of residuals, and independent observations. After all assumptions were met, a multiple regression was run again and the
regression model is shown in Table 1. The result showed that the significant predictor of e-commerce diffusion was government policy (p<0.01) in 75 countries from the WEF sample in 2001. The positive coefficient of this IV confirmed its role as e-commerce facilitator. Whenever the support from government policies increased 1 standard deviation and other independents were held constant, the average amount of Log (E-commerce diffusion-0.5) would increase 0.52 standard deviation. The effect of legal environment on e-commerce diffusion in the WEF sample was not found significant when other independents were held constant, even though its coefficient was positive. The relative importance of two IVs in predicting a country’s e-commerce diffusion in this given model was 5.7:1, corresponding to the ratio of unique contributions of government policy and legal environment. Supportive government policy was almost six times more important than legal environment in the prediction.

### Table 1. The multiple regression model for e-commerce diffusion in the WEF 2001-2002 sample

<table>
<thead>
<tr>
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<th>Standardized Coefficients (Beta)</th>
<th>t</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government policy</td>
<td>0.522</td>
<td>3.521</td>
<td>0.001</td>
</tr>
<tr>
<td>Legal environment</td>
<td>0.091</td>
<td>0.665</td>
<td>0.508</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>0.238</td>
<td>2.105</td>
<td>0.039</td>
</tr>
</tbody>
</table>

### 7.2 Phase-2 (2006-2007)

Based on the research model and its relevant hypotheses, the multiple regression equation using the WEF 2006-07 data was specified as follows.

\[
\text{E-commerce diffusion} = b_1 \times \text{Industrial environment} + b_2 \times \text{Government policy} + b_3 \times \text{Legal environment} + b_4 \times \text{GDP per capita} + c + e
\]

(2)

After dropping three outliers, the final multiple regression model is shown in Table 2. Both industrial environment and legal environment were the significant predictor of e-commerce diffusion (p<0.05) in 119 countries of the WEF 2006-07 sample. The positive coefficients of both IVs confirmed their roles as e-commerce facilitators. The effect of government policy on e-commerce diffusion was not significant and its coefficient was even negative. The relative importance of government policy and legal environment in predicting a country’s e-commerce diffusion in this given model was about 22:8:-1, corresponding to the ratio of unique contributions of industrial environment, legal environment and government policy. Industrial environment was almost three times more important than legal environment and more than 20 times more important than government policy in predicting a country’s e-commerce diffusion in 2006-07.

### Table 2. The multiple regression model for e-commerce diffusion in the WEF 2006-2007 sample

<table>
<thead>
<tr>
<th></th>
<th>Standardized Coefficients (Beta)</th>
<th>t</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial environment</td>
<td>0.662</td>
<td>7.355</td>
<td>0.000</td>
</tr>
<tr>
<td>Government policy</td>
<td>-0.030</td>
<td>-0.565</td>
<td>0.573</td>
</tr>
<tr>
<td>Legal environment</td>
<td>0.235</td>
<td>2.442</td>
<td>0.016</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>0.071</td>
<td>1.181</td>
<td>0.240</td>
</tr>
</tbody>
</table>

### 7.3 Analysis of Variables across Two Phases

For each pair of corresponding variables in two phases (e.g., the IVs of government policy in the WEF 2001-02 dataset and the WEF 2006-07 dataset), the reliability (or consistency), Pearson’s correlation and the mean difference of the measurement across two phases were evaluated and the results are shown in the following table. The results indicated that the measurements used in the WEF secondary analyses for governmental and legal factors and e-commerce diffusion were consistent and accurate across different points of time. The results also revealed that global e-commerce diffusion had improved significantly in the last five years. The government policy for e-commerce diffusion among the major countries in the world had also been more successful in the past five years. On the other hand, the legal environment had become less supportive for e-commerce diffusion over time.

### Table 3. The paired variables statistics of the WEF sample (2001/02—2006/07) (N=75)

<table>
<thead>
<tr>
<th>Pair</th>
<th>Variables</th>
<th>Cronbach’s alpha</th>
<th>Pearson’s correlation</th>
<th>Mean difference</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pair 1</td>
<td>Government policy</td>
<td>0.813</td>
<td>0.684*</td>
<td>-0.517</td>
<td>-7.266*</td>
</tr>
<tr>
<td>Pair 2</td>
<td>Legal environment</td>
<td>0.906</td>
<td>0.828*</td>
<td>0.275</td>
<td>4.413*</td>
</tr>
<tr>
<td>Pair 3</td>
<td>E-commerce diffusion</td>
<td>0.825</td>
<td>0.701*</td>
<td>-1.017</td>
<td>-13.536*</td>
</tr>
</tbody>
</table>

* p<0.01

After evaluating the variables across two periods, the multiple regression coefficients of these variables for
e-commerce diffusion in two samples are summarized in Table 4. The result shows that the government policy was an important facilitator of global e-commerce diffusion in the year of 2001-02; however, its impact was reduced and became insignificant in 2006-2007. The change of the effect of legal environment was in the opposite direction—it did not affect e-commerce diffusion across countries in 2001-02, but its importance increased recently.

Table 4. The multiple regression coefficients of the institutional variables for e-commerce diffusion in two phases

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Industrial environment</td>
<td>(n/a)</td>
<td>0.662**</td>
</tr>
<tr>
<td>Government policy</td>
<td>0.522**</td>
<td>Insignificant</td>
</tr>
<tr>
<td>Legal environment</td>
<td>Insignificant</td>
<td>0.235*</td>
</tr>
</tbody>
</table>

8. Discussion and Conclusion

8.1 Discussion of Findings

8.1.1 Phase-1 (2001-2002)

The secondary analysis at this phase confirmed strongly the research hypothesis with respect to government policy, but and was unable to demonstrate the causal-effect relationship between legal environment and e-commerce diffusion (see Table 5). In other words, the supportive government policy did exert a substantial positive impact on e-commerce diffusion in businesses around the world at the startup stage of e-commerce (the worldwide average score for e-commerce was only 2.37 out of 5 in the WEF 2001-02 dataset). Government promotions, financial incentives and encouraging policies fostered companies in many countries to engage in e-commerce around 2001/02. This finding proved the institutional perspective about the critical role of government in driving companies’ investment in e-commerce. On the other hand, the legal environment was commonly believed to lag behind the developments of technology, and in turn have a lagging effect on private sector. The issue of whether the legal environment in a country was supportive for e-commerce might be negligible until e-commerce became more pervasive in business operations. The lack of significance of legal environment seemed thus reasonable in the result.

Table 5. Summary of hypotheses and results at Phase-1

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Independent variable</th>
<th>Measurements for IV</th>
<th>Dependent variable</th>
<th>Measurements for DV</th>
<th>Supported</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Industrial environment</td>
<td>(n/a)</td>
<td>E-commerce diffusion</td>
<td>• E-commerce transaction</td>
<td>Yes</td>
<td>0.52</td>
</tr>
<tr>
<td>H2</td>
<td>Government policy</td>
<td>• Government priority/ vision</td>
<td>• Government promotion</td>
<td>• Government role model</td>
<td>No</td>
<td>0.09</td>
</tr>
<tr>
<td>H3</td>
<td>Legal environment</td>
<td>• Supportive/effective legal framework</td>
<td>E-commerce laws</td>
<td>• E-commerce laws</td>
<td>No</td>
<td>0.09</td>
</tr>
</tbody>
</table>

8.1.2 Phase-2 (2006-2007)

First, the worldwide average score for e-commerce diffusion had improved in the WEF 2006-07 dataset (3.90 out of 7). Second, comparing the latest WEF dataset with its 2001 version, the worldwide average score for government policy improved from 3.81 to 4.25 out of 7, but the score for legal environment decreased from 4.48 to 3.73 out of 7. The research finding at this phase show that industrial environment influenced countries’ e-commerce diffusion significantly (see Table 6). In the country with higher levels of market competition, supplier quality and technology absorption, the e-commerce diffusion was more extensive.

Table 6. Summary of hypotheses and results at Phase-2

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Independent variable</th>
<th>Measurements for IV</th>
<th>Dependent variable</th>
<th>Measurements for DV</th>
<th>Supported</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1</td>
<td>Industrial environment</td>
<td>• Market competition</td>
<td>• Supplier quality</td>
<td>• Firm-level technology absorption</td>
<td>Yes</td>
<td>0.66</td>
</tr>
<tr>
<td>H2</td>
<td>Government policy</td>
<td>• Government priority</td>
<td>• Government vision</td>
<td>• Government promotion</td>
<td>No</td>
<td>-0.03</td>
</tr>
<tr>
<td>H3</td>
<td>Legal environment</td>
<td>• Effective legal framework</td>
<td>E-commerce laws</td>
<td>Extent of business use of Internet</td>
<td>Yes</td>
<td>0.24</td>
</tr>
</tbody>
</table>

The finding also supported the impact of legal environment on e-commerce diffusion. If a national legal system was
adequate and effective for e-commerce practice, companies in that country might engage more in e-commerce operations. The effect of government policy on e-commerce has reduced since Phase-1. The changes of effects of legal and governmental factors in different directions implied that, as e-commerce developed and became a common practice in private sector, companies might face more legal issues and demanded legal certainty and protection. On the other hand, when e-commerce became more business-driven and integrated into regular business operations, the government policies were no longer vital for businesses and its influence became blurry.

8.2 Managerial Implication

Davenport in his book “Information Ecology: Mastering the information and knowledge environment” expounded that all companies have to be informed about the outside world: what customers need, what suppliers demand, what competitors are trying to accomplish, and what regulators insist they must do [12]. These external environments can consequently motivate organizational decisions and actions. Consistently, this study shows managers that firms do not make their e-commerce decisions independently from their external environments, nor are they powerful enough to ignore the external environment. Managers play the role of organizational architects who design an organization in a way that improves its ability to adapt to its environment [3]. They should therefore ensure that they are well-informed of the external environment, including industry situation, government policies and initiatives, and legal and regulatory changes. Based on the information and understanding of the external environment, managers should be able to design and implement their “e-strategies” that “fit” the environment and the e-strategies could be more efficient and successful. Managers will expect congruence or “institutional isomorphism” of e-commerce in businesses. If this is the case, managers could also expect the maximization of benefits offered by e-commerce.

According to institutional theory and the research finding in this study, firms themselves are also a part of institutions and thus play a role in creating and shaping the institutional environment. The role is more significant in the industrial environment in particular. Metcalfe’s law tells us that the value of e-commerce is proportional to the square of the number of companies in the industry participating in e-commerce. Therefore, managers should realize that, if they want to reap the full benefits of e-commerce, they need to get their business partners along the value chain “on board” as well.

8.3 Policy Implication

Experience has taught us that it is important to build a business-friendly climate for technology innovation and diffusion and support the entrepreneurial spirit that drives economic growth and development. The effects of the institutional environment will depend to a significant extent on how policy-makers, business players and other stakeholders will act and influence. Policies must be designed, articulated in coherent e-strategies and implemented in partnership with all relevant players to ensure that the opportunities provided by e-commerce are taken advantage of to improve the productivity of national economy and the enterprises within it [58]. According to this study, this is particularly vital at the infant stage of e-commerce. The advancement in e-commerce diffusion at Phase-1 (2001-2002) could be credited to supportive government policy. In particular, proactive government policies were the prime mover of e-commerce at the beginning in many developing countries.

On the other hand, although the lack of governmental supportive policies could be concerns of companies wanting to engage in e-commerce, that lack thereof would not deter enterprises from implementing e-commerce strategy nor inhibit the diffusion of e-commerce after its initial uptake. Rather it is more industry and/or market driven. The representative example here is the U.S.: e-commerce has flourished in the U.S. for many years without too much intervention of government. Thus, after an initial push on e-commerce adoption, governments should not interfere directly in private investments in e-commerce any more until there is a clear sign of industrial failure or market uncertainty and disturbance. Governments might rather take a more active role, in particular in addressing the lack of legal certainty and protection of e-commerce practice. Governments could put more efforts in laying out clear and solid policy, regulatory and technical foundations to ensure the trust and confidence among the B2B parties involved.

References


Abstract

This study aims to introduce various new electronic banking services in Jordan commercial bank, as a result of the government concerns for the development of e-business services in Jordan which includes: Electronic cards, ATM, Mobile bank, Internet bank, Voiced bank, Short messages services, Electronic payment and the effect of these services in customer acceptance and satisfaction.

This study will be developed depending on the previous studies and on the new information collection by designing questionnaire, and using statistics to analyze the study assumptions. This study can be understood through the following questions:

Does the new electronic banking services assist in the increase number of customers?

What are the acceptances of customers for these electronic services?

Keywords: E-business, e-Banking Services, e-Cards, Automated teller Machine (ATM), Mobile Bank, Internet Bank, Voiced Bank, Short Messages services, e-Payment.

1. Introduction

The financial companies and banks were started to use the new technology since 1980s [7]. First they concentrated their tension on the technology that accelerate the main bank operations. It was discovered that the use of new technology would increase the following issues:

- The quality of services that were offered to the customers
- Number of banking services that were offered to the customer
- Competition between banks
- Customer satisfactions with services which are provided by banks
- Customers’ tendency to deal with banks.

Recently new electronic services are discovered that are concentrated on communications and telecommunication technology which will add new services to banking sectors [15].

The Impact of Electronic Banking Services on Banks:

The use of new technology and internet in banking services was contributed in solving many obstacles and challenges that banks and customers face, when they use traditional services channels, and variety of banking services are provided 24 hrs daily for customer to satisfy their needs from banking services.

These new technologies are contributing in offering many new banking services such as: automated teller machine (ATM), voiced bank, internet bank, and so on.

These new automatic services were made banks work more efficiently, more attractive to customers, and concentrating the management and employee efforts for helping customers [10].

Since 1990s, most commercial banks were started to provide automating bank services for customers, especially credit cards and national express cards, which is considered to be one of the most popular services in Jordan. These services are developed continuously to satisfy customers needs, especially in the increases of competitions between banks, and the increase number of commercial banks in Jordan as it is known that the number of national and Arab commercial banks in Jordan exceed twenty one banks. Generally these commercial banks are providing the same services from credits, investments, and different other services that are depending directly on customers whom are persons, or companies.

So its found that these automated banking services help bank in increasing their ability for competition and customers’ trust in commercial bank, in addition to the other properties that play an important rule in providing good services for customers that utilize their time and effort especially it is known that these services are provided 24 hrs daily.

So from here the bank can develop its services depending on these new technology and the feed back that are supplied by customers suggestions about these services.
1.1 Electronic Banking Services
There are many electronic banking services that use new technology in doing many banking facilities and it will be explained later.

1.1.1 Automatic Teller Machine Services (ATM)
The banking sector in Jordan faced a great revolution [16], which is presented, used instead of money in (ATM) machines.
The principle of work for this magnetic cards in (ATM) was built upon the development of telecommunication network which is specialized to (ATM). So they connect these universal networks by smaller network in the world to enable customers to take these services in any part of the whole entire world with a very short response time.

1.1.2 Types of Banking Cards [11]
1.1.2.1 Automated Teller Machine Cards
These cards are one of the most famous card in Jordan, that enable any customer in the bank to obtain it, if he has a count, and enable him to: withdrawal or invest any time in his account, or know his account amount, or transfer from one account to another.

1.1.2.2 Credit Cards
These credit cards include the following types:
- Visa card, Master Card and American Express Cards: These Cards have the following types depending on their properties (Traditional cards (silver cards), Gold cards and Platen cards)

1.1.2.3 Visa Electronic Cards
These cards solve the (ATM) cards disadvantages by enable customer to control their account.

1.1.2.4 Smart Cards: These cards are not familiar and have a restrict applications.

1.1.3 Mobile Bank: It was built depending on WAP technology that enable customers to conduct with bank easily in both Arabic and English languages. This service is developed rapidly as a result of mobile telecommunications revolution. It is used to pay bills and convert customers’ accounts.

1.1.4 Internet Bank: Internet banks help customers to do all the bank’s operations by using the Internet facilities. It is considered to be one of the most important applications of electronic business (e-business) depending on the virtual working banking environment.

1.1.5 Voiced Bank: It is considered one of the most famous electronic banking services that enable customer to order their needs directly by using their voice, which is register on the service machine.

1.1.6 Short Message Services (SMS): The banks support their customers’ needs through using short message services by sending any vital information to their customers, after the operation is completed.

1.1.7 Electronic Payment: This service was developed and built depending on the techniques that are used in mobile bank. It enables the customers to know the value of their goods instantaneously when they are shopping and gives them the opportunity to pay using the mobile.

1.2 The Effected Factors in Customers Attractions to Banks
1.2.1 Relations Built with Customers [8]
The use of new techniques in banking marketing and promotions play an important rule in customers trust to deal with banks, so as a result of this banks have two techniques to achieve their trust:
1. Marketing on personal level by trying to satisfy personal customers needs (i.e.) concern with their personality needs.
2. Their personal needs include their birthdays, social occasions and so on, to built a strong relation with them such as sending congratulations and gifts for them in these occasions.

1. Forecasting Models: These techniques are very important methods to build strong bridges with customers by forecasting their needs through the use of Frequently Asked Questions (FAQ).

1.2.2 Factors That Determine Service Quality From Customer Viewpoint
These factors can be classified as follow [12]
without needs for queuing or waiting to achieve these services.

- **Security:** It means that the service is free from dangers.
- **Trust:** The service is trust free from error.
- **Understandability:** The service is simple and has well-defined procedures. It does not need training.
- **Responsibility:** It means real time and fast response to provide these services.
- **Employee Skills:** What are the skills that employees have to own in order to perform their works efficiently, and how they can use their analysis and prediction skills to provide banking services to customers.
- **Tangible Assets:** Normally service quality can be evaluated through the tangible facilities that were provided to customers, like tools, machines, human resources, and communication devices that are related to service provider.
- **Communication:** Does the service provider able to introduce customers about the services, and the methods that the customers play to obtain the required services. Does the service provider introduce the customers about the troubles that occur in the system of service evaluation.

1.2.3 **Factors that effect customers expectation:** There exist five factors that effect customer expectation, which include the following [8]: Reputation, Customers’ needs and preferences, External communication and Social engineer scenarios by knowing how to effect customers sympathy.

1.2.4 **Factors That Effect Deposit Attraction [4]**

The deposits attraction depend on the following factors: economical and political stability, the trust to deal with banks increase with the increasing of stability environment, as it is a vital thing for banks’ development and bank properties. Moreover customers like to deal with banks that have the following properties: - good reputation, good environment, fast response time to services, reliable services and high employee performance

Providing new and incentive courage to customers: banks continually change the interest rate as a result of their strategies to be able to face competitions. Develop services level and types of banking services. Banks try to promote for new services to customers and train their employees to provide a good service to customer by having an office for development and training.

- Bank location: The bank location is a vital thing for customers’ success because customers do not like to travel and like to receive services from a close location. So banks try to open many branches as possible to reduce travel distance to customers.
- Main bank policies and the strength of its financial position
  As the bank policies are correct and stable, the banks will do their works efficiently. Also as bank liquidity is sufficient this will support their reputation.
- Providing new services: People like new things and changes, so providing modern banking services will have a positive influence on banks performance.

1.3 **New Banking Services [2]**

The Banks and financial services sectors are facing dynamic changes and main challenges that include the increase of competition between bank and competition between banks and other services or production sectors. So as a result of these rapidly competition and diversity of investment sectors, banks develop the services that they provide for their customers to run concurrently with the society development. These new banking services are considered the main source for banks incomes, also these services include the following.

- **New Creating Accounts:** include increase interested rate or investment accounts, Contracting investment accounts, Student investment account for learning, and collection accounts that provide several integrated services for customers.
- **Authorization Services:** include buying invoices from vendors and pay their values then generate their values from buyers by taking especial commission from vendors. These authorizations have many types depending on the type of commission.
- **Checks insurance Card:** These Cards are discharged by banks to their customers, In order to use them as an Insurance for commercial markets to take checks instead of money, but these cards have a limit duration (i.e.) it can be used for a fixed period of time for one month as an example.
- **Automated Teller Machine:** The ATM devices can be worked indifferent tradition or in tradition operations such as money depositing or withdrawing or other banking services. One of the best services that ATM provide, it can expose false money from real ones and when it is emphasized from the money, the device add the deposit money amount to the client account.
want, then transferring these to bank employees. These centers can be placed instead of traditional banks and play a vital role especially in industrial countries.

- **Smart card**: These cards contain computer chips and microprocessors without the need to connect with a computer for banks. These include: visa cards, master cards, and American Express cards. These cards enable clients (Customers) to buy anything they want also they can be charged by any amount of money by using ATM machines, also these cards can be worked as an electronic bank packets that give clients no need to carry money. One of the famous smart cards globally is Mondex card that generates many advantages for its users.

- **End of sale points services**: These include multi financial services to automatic lift up in commercial markets such as checks assurance, indirect payment by electronic translation from buyer accounts to merchants accounts by using client cards and the merchant processing devices. Also there are a direct payment services but portent the involvement of creditor in automatic payment system.

- **Electronic check translation services**: Translating check write information to electronic information and then using these information for commercial transactions does this. There is a complete check system that is called check transaction.

- **Banking services through the INTERNET networks**: Nowadays many banks in the world have their position on their website, that enable them to promote them along the world in addition to the fast communication with a low cost and this result in the increase number of services via the internet.

One of the famous banks in the world that use the Internet to provide services via the net is American Citi bank.

### 1.4 Research Problem

The bank sectors and banks nowadays play a vital position in the economic sector, since they receive money from customers and invest them in other economical development national sectors such as: industry, agriculture and other sectors, in addition to the other services that offered toward their clients. The Jordan commercial banks are developed greatly especially in the last three years. The numbers of commercial banks in Jordan are increased to attract clients toward invest their money in these banks, since most of these banks budgets depend on customers’ deposits. As a result of these banks revolution, banks’ managers understand the importance of the marketing techniques to attract more customers toward their banks.

In Jordan, since the market is limited and small, banks start to develop their services to satisfy their customers needs, through continuously inserting the new discovered technology in banking services.

The new technology are developed greatly because of the wide spread of Internet network and the fast degree of communication media, so banks began to take advantage of these new electronic channels to satisfy their customers’ needs by developing the quality of services, which are provided. The study problem is presented by determining the type of relation between new electronic services and the degree by which these services influence in attracting more customers to deal with these commercial banks in Jordan, so the study problem can be presented through the following questions:

1. Do the new electronic services attribute in increasing the number of customers in Jordan commercial banks that use these services?
2. What is the acceptance of customers toward these services?

### 1.5 The importance of the study

The commercial banks as mentioned play a vital role in Jordan economy, since these banks do many tasks that depend on collecting inputs of the national economy to use them in society development programs in addition to their importance in keeping money stability in national economy.

Banks should interest in developing their services, in order to attract more customers, since most of their budgets depend on clients (local or foreign) deposits.

So banks start to use the new electronic services toward their customers’ loyalty and acceptance through increasing the services speed, reliability, and quality with minimum cost.

The study are vital for both the banks and customers, for banks through developing their services, increase the number of their customers, and conserve their current customers. For customers through enabling them to get there needs.

### 1.6 Research objectives

This study aims in finding the influence of using new electronic services upon increasing the number of customers in Jordan commercial banks. Also measuring the relation between the banks that use these new electronic services and the effect of this in increasing the number of customers. Offering suggestions and recommendations that direct Jordan commercial banks to use these services in order to satisfy their customers needs.
2. Literature Review
As it is known that the implementation of new electronic services in Jordan commercial banks is recent, so the studies and researches in this field have a shortage and leakage.
From these studies which are related to these topics are:

- The study which is done by Osma [5] that aimed in collecting information about the external and internal factors that affect the works of Jordan commercial banks, one of these factors is the affect of using new technology development in the working of these banks. This study found that there is a high statistical influence between the use of new technology development and acceptance of commercial banks’ clients.

- The study which is done by Atal [6] that aimed in the introduction of commercial banks’ managers in the investment in new technology and telecommunication services such as the use of the Internet in practicing various banks services. This study found that there is a high intensity of manager toward using the Internet in promoting their banks' services and marketing programs.

- The study which is done by Meqdady [13] that aimed in the measurement of customers acceptance and understanding of these new information systems and the influence of these system towards dealing with banks. This study found that most of commercial banks use these services toward developing the degree levels of these services, which are offered to their customers. The study which is done by Barnewell [14] that aimed in introducing the opinion of customers toward the services that offered by banks’ sector. This study found that there is a leakage of strategic planning toward developing the quality of the services that are provided to customers.

- The study which is done by Stone [9] that aimed on the knowledge and introduction of environmental challenges that have a great influence on banks manufacturing sectors, especially the economical changes. The study found that, the banks should adapt certain rules toward organizing their practices, and marketing strategies through offering their customers the best services they have. Study which is done by Shafeg [1] that aimed on knowing the factors which, effect customers’ selection of the banks they prefer to deal with. The study found that the factors that effect the selection of banks are: location, reputation, incentives, services response time, existing of atm machine and speed.

3. Research Model
This study will concern with studying the relation between these variables and the influence of dependent variables on the independent variables as it will be seen later.

**Dependent variable:** It is represented by customers’ attractive factors.

**Independent variables:**
The use of electronic banking services which can be classified as follow:
- The ease of using new technology
- The speed of performing operations and transactions
- The reliability and accuracy of operations
- Client's trust
- Client's satisfactions
- Security and protection of data
- Availability of new electronic banking services
- Bank's experience
- Providing of incentives and prizes
Many hypotheses were built to develop the scope of the study as follow:

<table>
<thead>
<tr>
<th>#</th>
<th>Hypothesis 1</th>
<th>Hypothesis 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>H0: The use of new technology has no influence on increasing number of banks' customers</td>
<td>H1: The use of new technology has influence on increasing number of banks' customers</td>
</tr>
<tr>
<td>2</td>
<td>H0: The simplicity of technology does not courage customers to deal with banks</td>
<td>H1: The simplicity of technology encourages customers to deal with banks</td>
</tr>
<tr>
<td>3</td>
<td>H0: Security and protection have no effect on customers attraction to deal with banks</td>
<td>H1: Security and protection effect on customers attraction to deal with banks</td>
</tr>
<tr>
<td>4</td>
<td>H0: The speed of transactions and operations has no effect on customers ability to deal with banks</td>
<td>H1: The speed of transactions and operations has effect on customers ability to deal with banks</td>
</tr>
<tr>
<td>5</td>
<td>H0: The accuracy of performing operations has no effect on customers satisfaction</td>
<td>H1: The accuracy of performing operations has effect on customers satisfaction</td>
</tr>
<tr>
<td>6</td>
<td>H0: Client's trust with bank has no effect on the number of customers</td>
<td>H1: Client's trust with bank effect on increasing the number of customers</td>
</tr>
<tr>
<td>7</td>
<td>H0: Bank's reputation and experience has no effect on the increase number of customers</td>
<td>H1: Bank's reputation and experience has effect on the increase number of customers</td>
</tr>
<tr>
<td>8</td>
<td>H0: The wide spread of bank's branches has no effect on the increase number of customers</td>
<td>H1: The wide spread of bank's branches has effect on the increase number of customers</td>
</tr>
<tr>
<td>9</td>
<td>H0: Customers satisfactions have no effect on the increase number of customers</td>
<td>H1: Customers satisfactions have effect on the increase number of customers</td>
</tr>
<tr>
<td>10</td>
<td>H0: Providing of incentives and prizes does not increase the numbers of bank's customers</td>
<td>H1: Providing of incentives and prizes increase the numbers of bank's customers</td>
</tr>
</tbody>
</table>

In this study two types of questionnaires were developed one for commercial banks' clients (customers), and the other for commercial banks' employees. These questionnaires are put in the index of the study.

3.2 Data Analysis
3.2.1 Data Analysis That are Related to Customers
3.2.1.1 Test first hypothesis
H0: The use of new technology has no influence on increasing number of banks' customers.  
H1: The use of new technology has an influence on increasing number of banks' customers.

From the analysis of the study related questions to this hypothesis, it is found that 78% of clients emphasize that the use of new technology is a reason that courage them to deal with banks. The measure of the first hypothesis using Chi-Square. So according to the analysis of Chi-Square the table value = 7.815, which lead to the accept of alternative hypothesis (H1) and reject of (H0).

Table 2 Chi square for hypothesis 1

<table>
<thead>
<tr>
<th>Test Statistics</th>
<th>q1</th>
<th>q3</th>
<th>q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square a</td>
<td>25.000</td>
<td>23.000</td>
<td>7.600</td>
</tr>
<tr>
<td>df</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>0.000</td>
<td>0.000</td>
<td>0.055</td>
</tr>
</tbody>
</table>

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 10.0.
H1: The simplicity of technology encourages customers to deal with banks.

From the analysis of the study related questions to this hypothesis, it is found that 68.5% from the clients emphasize that the simplicity of using technology contribute on persuading them to deal with banks. The measure of the second hypothesis using Chi-Square. So according to the analysis of Chi-Square the table values (Q1 =9.488, Q2=7.825) which lead to the accept of alternative hypothesis (H1) and reject of (H0).

Table 3 Chi square for hypothesis 2

<table>
<thead>
<tr>
<th>Test Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
</tr>
<tr>
<td>df</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
</tr>
</tbody>
</table>

- 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 8.0.
- 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 10.0.

3.2.1.3 Test Third Hypothesis

H0: Security and protection have no effect on customers attraction to deal with banks.
H1: Security and protection effect on customers attraction to deal with banks.

From the analysis of the study related questions to this hypothesis, it is found that 63.75% from the clients emphasize that security and access control to their data are strong factors that lead them to deal with any bank. The measure of the third hypothesis using Chi-Square. So according to the analysis of Chi-Square the table values=7.815, which lead to the accept of alternative hypothesis (H1) and reject of (H0).

Table 4 Chi square for hypothesis 3

<table>
<thead>
<tr>
<th>Test Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
</tr>
<tr>
<td>df</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
</tr>
</tbody>
</table>

- 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 10.0.

3.2.1.4 Test Fourth Hypothesis

H0: The speed of transactions and operations has no effect on customers ability to deal with banks.
H1: The speed of transactions and operations has effect on customers ability to deal with banks.

From the analysis of the study related questions to this hypothesis, it is found that 71.25% from the clients emphasize that speed of performing bank’s transactions are strong factors that lead them to deal with banks. The measure of the fourth hypothesis using Chi-Square. So according to the analysis of Chi-Square the table values=7.815, which lead to the accept of alternative hypothesis(H1) and reject of (H0).
3.2.1.5 Test fifth hypothesis
H0: The accuracy of performing operations has no effect on customers satisfaction.
H1: The accuracy of performing operations has effect on customers satisfaction.
From the analysis of the study related questions to this hypothesis, it is found that 55% from the clients prefer accurate operations. The measure of the fifth hypothesis using Chi-Square. So according to the analysis of Chi-Square the table values=9.488, which lead to the accept of alternative hypothesis (H1) and reject of (H0).

Table 6 Chi square for hypothesis 6

| Test Statistics |
|-----------------|-----------------|-----------------|
| Chi-Square      | q10             | q11             |
| df              | 3               | 3               |
| Asymp. Sig.     | .019            | .000            |

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 10.0.

3.2.1.6 Test Sixth Hypothesis
H0: Client's trust with bank has no effect on the number of customers.
H1: Client's trust with bank effect on increasing the number of customers.
From the analysis of the study related questions to this hypothesis, it is found that 71.25% from the clients’ factors that lead them to deal with banks their trust.
The measure of the sixth hypothesis using Chi-Square. So according to the analysis of Chi-Square the table values=7.815, which lead to the accept of alternative hypothesis (H1) and reject of (H0).

Table 7 Chi square for hypothesis 6

| Test Statistics |
|-----------------|-----------------|-----------------|
| Chi-Square      | q12             | q19             |
| df              | 3               | 3               |
| Asymp. Sig.     | .000            | .000            |

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 8.0.

3.2.1.7 Test Seventh Hypothesis
H0: Bank's reputation and experience has no effect on the increase number of customers.
H1: Bank's reputation and experience has effect on the increase number of customers.
From the analysis of the study related questions to this hypothesis, it is found that 74.375% from the clients deal with banks according the banks' reputation and experience. The measure of the seventh hypothesis using Chi-Square. So according to the analysis of Chi-Square the table values=7.815, which lead to the accept of alternative hypothesis (H1) and reject of (H0).
3.2.1.8 Test Eighth Hypothesis

H0: The wide spread of bank's branches has no effect on the increase number of customers.
H1: The wide spread of bank's branches has effect on the increase number of customers.

From the analysis of the study related questions to this hypothesis, it is found that 72.5% from the clients deal with banks according the ease of reaching banks (i.e.) wide geographical spread. The measure of the eighth hypothesis using Chi-Square. So according to the analysis of Chi-Square the table values=9.488, which lead to the accept of alternative hypothesis (H1) and reject of (H0).

Table 9 Chi square for hypothesis 8

<table>
<thead>
<tr>
<th>Test Statistics</th>
<th>q5</th>
<th>q18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>21.800</td>
<td>38.000</td>
</tr>
<tr>
<td>df</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>.000</td>
<td>.000</td>
</tr>
</tbody>
</table>

3.2.1.9 Test Ninth Hypothesis

H0: Customers satisfactions have no effect on the increase number of customers.
H1: Customers satisfactions have an effect on the increase number of customers.

From the analysis of the study-related questions to this hypothesis, it is found that 64.1% from the client’s deal with banks according their satisfactions that result from the services that the bank provide. The measure of the ninth hypothesis using Chi-Square. So according to the analysis of Chi-Square the table values=7.815, which lead to the accept of alternative hypothesis (H1) and reject of (H0).

Table 10 Chi square for hypothesis 9

<table>
<thead>
<tr>
<th>Test Statistics</th>
<th>q15</th>
<th>q20</th>
<th>q7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>35.400</td>
<td>21.000</td>
<td>12.000</td>
</tr>
<tr>
<td>df</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>.000</td>
<td>.000</td>
<td>.017</td>
</tr>
</tbody>
</table>

3.2.1.10 Test Tenth Hypothesis
banks according the encourages provide by banks through incentives and prizes programs. The measure of the tenth hypothesis using Chi-Square. So according to the analysis of Chi-Square the table values=9.488, which lead to the accept of alternative hypothesis (H1) and reject of (H0).

Table 11 Chi square for hypothesis 10

<table>
<thead>
<tr>
<th>Test Statistics</th>
<th>q23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square a</td>
<td>10.750</td>
</tr>
<tr>
<td>df</td>
<td>4</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>.030</td>
</tr>
</tbody>
</table>

a. 0 cells (.0%) have expected frequencies less than
5. The minimum expected cell frequency is 8.0.

3.2.2 The Analysis of Bank’s Employee Questionnaire

- Personal questions, gender and the analysis of the age of the sample people

Table 12 Age of the sample

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;25</td>
<td>9</td>
<td>23.7</td>
<td>23.7</td>
<td>23.7</td>
</tr>
<tr>
<td>25-30</td>
<td>16</td>
<td>42.1</td>
<td>42.1</td>
<td>65.8</td>
</tr>
<tr>
<td>30-35</td>
<td>8</td>
<td>21.1</td>
<td>21.1</td>
<td>86.8</td>
</tr>
<tr>
<td>35-40</td>
<td>2</td>
<td>5.3</td>
<td>5.3</td>
<td>92.1</td>
</tr>
<tr>
<td>&gt;40</td>
<td>3</td>
<td>7.9</td>
<td>7.9</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Table 13 The Education Level Of The Study Sample

<table>
<thead>
<tr>
<th>Qualification</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diploma</td>
<td>2</td>
<td>5.3</td>
<td>5.3</td>
<td>5.3</td>
</tr>
<tr>
<td>B.Sc</td>
<td>31</td>
<td>81.6</td>
<td>81.6</td>
<td>86.8</td>
</tr>
<tr>
<td>Master</td>
<td>5</td>
<td>13.2</td>
<td>13.2</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>
Figure 1: Education level of the sample

- The Amount of Sample Monthly Income

![Pie chart showing income distribution]

Figure 2: Income of the sample

- According to the statistical analysis of the sample data, the following results are found

Table 14: Data analysis

<table>
<thead>
<tr>
<th>Descriptive Statistics</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>38</td>
<td>1.58</td>
<td>.50</td>
<td>.250</td>
</tr>
<tr>
<td>Age</td>
<td>38</td>
<td>2.32</td>
<td>1.14</td>
<td>1.303</td>
</tr>
<tr>
<td>Income</td>
<td>38</td>
<td>2.21</td>
<td>.93</td>
<td>.873</td>
</tr>
<tr>
<td>Qualification</td>
<td>38</td>
<td>3.08</td>
<td>.43</td>
<td>.183</td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 3.3 Data Analysis for the Employees Questionnaire

#### 3.3.1 Test first Hypothesis

**H0:** The use of new technology has no influence on increasing number of banks' customers.

**H1:** The use of new technology has an influence on increasing number of banks' customers.

From the analysis of the study related questions to this hypothesis, it is found that 90% of clients emphasize that the use of new technology is a reason that courage them to deal with banks.

- The measure of the first hypothesis using Chi-Square.

So according to the analysis of Chi-Square the table value=5.9911, which lead to the accept of alternative hypothesis (H1) and reject of (H0).

#### Table 16 Results for hypothesis 1

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>q1</td>
<td>38</td>
<td>1.61</td>
<td>.55</td>
<td>.299</td>
</tr>
<tr>
<td>q2</td>
<td>38</td>
<td>1.55</td>
<td>.55</td>
<td>.308</td>
</tr>
<tr>
<td>q3</td>
<td>38</td>
<td>1.79</td>
<td>.78</td>
<td>.603</td>
</tr>
<tr>
<td>q4</td>
<td>38</td>
<td>2.13</td>
<td>.93</td>
<td>.874</td>
</tr>
<tr>
<td>q5</td>
<td>38</td>
<td>1.89</td>
<td>.98</td>
<td>.962</td>
</tr>
<tr>
<td>q6</td>
<td>38</td>
<td>1.55</td>
<td>.83</td>
<td>.686</td>
</tr>
<tr>
<td>q7</td>
<td>38</td>
<td>1.66</td>
<td>.88</td>
<td>.772</td>
</tr>
<tr>
<td>q8</td>
<td>38</td>
<td>2.34</td>
<td>1.15</td>
<td>1.312</td>
</tr>
<tr>
<td>q9</td>
<td>38</td>
<td>2.66</td>
<td>.99</td>
<td>.988</td>
</tr>
<tr>
<td>q10</td>
<td>38</td>
<td>1.76</td>
<td>.75</td>
<td>.564</td>
</tr>
<tr>
<td>q11</td>
<td>38</td>
<td>1.50</td>
<td>.76</td>
<td>.581</td>
</tr>
<tr>
<td>q12</td>
<td>38</td>
<td>2.18</td>
<td>1.11</td>
<td>1.235</td>
</tr>
<tr>
<td>q13</td>
<td>38</td>
<td>1.42</td>
<td>.55</td>
<td>.304</td>
</tr>
<tr>
<td>q14</td>
<td>38</td>
<td>1.53</td>
<td>.69</td>
<td>.472</td>
</tr>
<tr>
<td>q15</td>
<td>38</td>
<td>1.29</td>
<td>.46</td>
<td>.211</td>
</tr>
<tr>
<td>q16</td>
<td>38</td>
<td>2.29</td>
<td>.87</td>
<td>.752</td>
</tr>
<tr>
<td>q17</td>
<td>38</td>
<td>2.45</td>
<td>1.20</td>
<td>1.443</td>
</tr>
<tr>
<td>q18</td>
<td>38</td>
<td>1.53</td>
<td>.69</td>
<td>.472</td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Test Statistics

<table>
<thead>
<tr>
<th></th>
<th>q1</th>
<th>q2</th>
<th>q3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>17.105</td>
<td>16.158</td>
<td>25.579</td>
</tr>
<tr>
<td>df</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
</tbody>
</table>

- a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 12.7.
- b. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 9.5.

#### 3.3.2 Test Second Hypothesis

**H0:** The simplicity of technology does not courage customers to deal with banks.

**H1:** The simplicity of technology encourages customers to deal with banks.

From the analysis of the study related questions to this hypothesis, it is found that 85% from the clients emphasize that the simplicity of using technology contribute on persuading them to deal with banks.

- The measure of the second hypothesis using Chi-Square.
Table 17 Results for hypothesis 2

<table>
<thead>
<tr>
<th>Test Statistics</th>
<th>q6</th>
<th>q7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square a</td>
<td>31.263</td>
<td>25.789</td>
</tr>
<tr>
<td>df</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>.000</td>
<td>.000</td>
</tr>
</tbody>
</table>

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 9.5.

3.3.3 Test third hypothesis
H0: Security and protection have no effect on customers attraction to deal with banks.
H1: Security and protection effect on customers attraction to deal with banks.
From the analysis of the study related questions to this hypothesis, it is found that 85% from the clients emphasize that security and access control to their data are strong factors that lead them to deal with any bank.
- The measure of the third hypothesis using Chi-Square.
So according to the analysis of Chi-Square the table values=7.815, which lead to the accept of alternative hypothesis (H1) and reject of (H0).

Table 18 Results for hypothesis 3

<table>
<thead>
<tr>
<th>Test Statistics</th>
<th>q11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square a</td>
<td>34.211</td>
</tr>
<tr>
<td>df</td>
<td>3</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>.000</td>
</tr>
</tbody>
</table>

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 9.5.

3.3.4 Test fourth hypothesis
H0: The speed of transactions and operations has no effect on customers ability to deal with banks.
H1: The speed of transactions and operations has effect on customers ability to deal with banks.
From the analysis of the study related questions to this hypothesis, it is found that 62.5% from the clients emphasize that speed of performing bank’s transactions are strong factors that lead them to deal with banks. The measure of the fourth hypothesis using Chi-Square. So according to the analysis of Chi-Square the table values=3.841, which lead to the accept of alternative hypothesis (H1) and reject of (H0).

Table 19 Results for hypothesis 4

<table>
<thead>
<tr>
<th>Test Statistics</th>
<th>q15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square a</td>
<td>6.737</td>
</tr>
<tr>
<td>df</td>
<td>1</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>.009</td>
</tr>
</tbody>
</table>

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 19.0.

3.3.5 Test Fifth Hypothesis
H0: The accuracy of performing operations has no effect on customers satisfaction.
H1: The accuracy of performing operations has effect on customers satisfaction.
From the analysis of the study related questions to this hypothesis, it is found that 90% from the clients prefer accurate operations. The measure of the fifth hypothesis using Chi-Square. So according to the analysis of Chi-Square the table values=7.815, which lead to the accept of alternative hypothesis (H1) and reject of (H0).
3.3.6 Test Sixth Hypothesis

H0: Client’s trust with bank has no effect on the number of customers.
H1: Client’s trust with bank effect on increasing the number of customers.

From the analysis of the study related questions to this hypothesis, it is found that 70% from the clients’ factors that lead them to deal with banks their trust. The measure of the sixth hypothesis using Chi-Square. So according to the analysis of Chi-Square the table values=9.488, which lead to the accept of alternative hypothesis (H1) and reject of (H0).

Table 21 Results for hypothesis 6

<table>
<thead>
<tr>
<th>Test Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Chi-Square</td>
</tr>
<tr>
<td>df</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
</tr>
</tbody>
</table>

3.3.7 Test Seventh Hypothesis

H0: Bank’s reputation and experience has no effect on the increase number of customers.
H1: Bank’s reputation and experience has effect on the increase number of customers.

From the analysis of the study related questions to this hypothesis, it is found that 73.75% from the clients deal with banks according the banks’ reputation and experience. The measure of the seventh hypothesis using Chi-Square. So according to the analysis of Chi-Square the table values=7.815, which lead to the accept of alternative hypothesis (H1) and reject of (H0).

Table 22 Results for hypothesis 17

<table>
<thead>
<tr>
<th>Test Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Chi-Square</td>
</tr>
<tr>
<td>df</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
</tr>
</tbody>
</table>

3.3.8 Test Eighth Hypothesis

H0: The wide spread of bank’s branches has no effect on the increase number of customers.
H1: The wide spread of bank’s branches has effect on the increase number of customers.

From the analysis of the study related questions to this hypothesis, it is found that 58.75% from the clients deal with banks according the ease of reaching banks (i.e.) wide geographical spread. The measure of the eighth hypothesis
### Table 23 Results for hypothesis 8

<table>
<thead>
<tr>
<th>Test Statistics</th>
<th>q9</th>
<th>q10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>15.684</td>
<td>3.842</td>
</tr>
<tr>
<td>df</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>.003</td>
<td>.146</td>
</tr>
</tbody>
</table>

- a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 7.6.
- b. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 12.7.

#### 3.3.9 Test Ninth Hypothesis

**H0:** Customers satisfactions have no effect on the increase number of customers.  
**H1:** Customers satisfactions have an effect on the increase number of customers.  

From the analysis of the study related questions to this hypothesis, it is found that 70% from the clients deal with banks according their satisfactions that result from the services that the bank provide. The measure of the ninth hypothesis using Chi-Square. So according to the analysis of Chi-Square the table values=9.488, which lead to the accept of alternative hypothesis (H1) and reject of (H0).

#### Table 24 Results for hypothesis 9

<table>
<thead>
<tr>
<th>Test Statistics</th>
<th>q12</th>
<th>q13</th>
<th>q17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>14.895</td>
<td>19.316</td>
<td>7.000</td>
</tr>
<tr>
<td>df</td>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>.005</td>
<td>.000</td>
<td>.136</td>
</tr>
</tbody>
</table>

- a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 7.6.
- b. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 12.7.

#### 3.3.10 Test Tenth Hypothesis

**H0:** Providing of incentives and prizes does not increase the numbers of bank's customers.  
**H1:** Providing of incentives and prizes increases the numbers of bank's customers.  

From the analysis of the study related questions to this hypothesis, it is found that 57.5% from the clients deal with banks according the encourages provide by banks through incentives and prizes programs. The measure of the tenth hypothesis using Chi-Square. So according to the analysis of Chi-Square the table values=9.488, which lead to the accept of alternative hypothesis (H1) and reject of (H0).

#### Table 25 Results for hypothesis 10

<table>
<thead>
<tr>
<th>Test Statistics</th>
<th>q8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chi-Square</td>
<td>10.684</td>
</tr>
<tr>
<td>df</td>
<td>4</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
<td>.030</td>
</tr>
</tbody>
</table>

- a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 7.6.

### 4. Conclusions
These new electronic services are considered to be a major service and it is difficult to get rid of them from customers, since customers tendency towards these services are increased because of the short response time.

This study shows that there is a strong relation between the use of new electronic services and the increase number of customers whom want to use these services (i.e.). These services are strong attractive factors to deal with banks. So these services increase banks ability to take their position in competition.

This study shows that the new electronic services contribute in solving many problems and obstacles that face customers when they use traditional methods, since these services are continually diverging, so these traditional methods where unable to handle these changes.

This study emphasis that the new electronic services contribute in the increase satisfaction of banks' customers, and strength their trust to deal with banks because banks serve them continually and 24 hrs daily.

This study shows that these services contribute in developing the quality and level of services that are provided to customers, and contribute in developing the level of services by inserting new technology in banks.

4.1 Recommendations

According to the study result, the following recommendations are established:

- The Jordan commercial banks should take advantage of the new electronic banking services and utilize these services in their marketing programs as a tool to attract customers to deal with them, since these services contribute in the increase degree of competition between banks and in developing their market reputation.
- The Jordan commercial banks should promote these services, explain their benefits, and explain how to use these services by using a high level promotion programs and techniques.
- The banks should be on line with customers by having one to one relations, through continually solving their problems and trying to know their needs, opinions, and expectations towards these services, by using electronic dialog boxes, or even using traditional suggestion boxes.
- The banks should continually introduce to customers' visions towards new electronic services, and should try to satisfy their needs.
- The banks should be up to date with any new discovered services that assets customer transactions and works.
- The banks should continually train their employees about new technology to develop their work level.

References


The World Bank
Classifying PC Banking Users vs. Non PC banking Users

Wen Yin, Adelphi University, USA, yin@adelphi.edu

Abstract

Bank profitability is strongly related to e-banking. Convenience, familiarity and perceived ease of use, and security and privacy have been found to be major concerns customers have towards using e-banking product and services[1]. This study tried to classify PC banking users and non PC banking users by using a binary response variable (PC banking users vs. non PC banking users), as well as seven predictor variables (income, net worth, age, education, race, gender, financial sophistication, and years with bank) with CHAID TREE and CART. Data were divided into a training data set (60% of the data), validation data set (20% of the data), and test data set (20% of the data). A predictive classification model was estimated and validated for CHAID and CART. Results from CHAID and CART were compared.

References

Internet and ITC Use among Agricultural SMEs: Evidence from Hawaii

Kelly Burke, University of Hawaii at Hilo, Hawaii, kellyb@hawaii.edu

Abstract

Much of the SME research examining adoption and use of Internet and information and communication technologies (ICT) to date has argued that firms adopt and use the Internet and related ICTs to different extents depending on firm size, industry type and CEO education. To understand these issues studies tend to compare firms across industry sectors. The results though are mixed. Moreover, only a small percentage of SME ICT studies target agricultural firms. The study presented here surveyed SME farm operators in a narrow set of grower/producer sectors. Results indicate wide use of computers and the Internet, especially for functions like email, online purchasing, and online business-related research. Website ownership is less widespread. The study also surveyed the firms about their use of emerging social technologies like instant messaging, chat, blogs, etc. Perceptions of ICT benefits and reasons for not investing in them are discussed. Implications for future research and farm operators are also discussed.

1. Introduction

Prior research suggests that drivers of computer technology adoption in small businesses include lack of financial resources [9], lack of personnel with technical expertise [11], and the CEOs lack of experience with various information and communication technologies - ICTs [19]. A theme of these studies describes ‘resource poverty’ to be a common impediment to IT adoption. Small firms typically have fewer resources available than larger ones and are therefore less able to invest in computer technologies than large firms. Although resource restrictions certainly play a role in IT adoption, the need to acquire new systems must also play a role. As firms grow they become more complex to manage. Greater organizational complexity requires more complex information capture and access strategies, entailing greater reliance on the structure and support provided by information systems. Thus, small firms become more motivated to obtain information technologies as they experience the need for more efficient and sophisticated information management. A logical conclusion seems to be that as a small business grows, it will experience a corresponding need for increasing adoption of all forms of IT.

It is also reasonable to presume that the industry sector a small business competes in can affect their systems requirements. For instance information intensity refers to the degree to which information is present in a business’ primary product or service. Although no significant relationship was found between information intensity and likelihood of computer adoption, it was significantly related to extent of adoption [24]. Other studies have found differences in application complexity as a function of industry [12]. In other words, the characteristics of the industry sector a firm competes in likely affect the company’s technology use, hence we expect that SME agribusinesses producing different crops will exhibit different ITC adoption and use patterns.

CEO education has been considered as a factor in ICT adoption by SMEs. For instance, although level of end-user education is significantly related to ICT satisfaction, no significant relationship between education level and use was found [9]. In that study however, end-users were workers in the general company population. In the current study, CEOs/operators in smaller businesses are seen as taking the role of end-users. More educated operators are more likely to have been exposed to computers during advanced education courses and are thus more likely to support ICT adoption.

ICT Use in SME Agribusiness

The studies discussed above examined SMEs across a variety of business and industry sectors. However, the bulk of past SME research has either ignored agribusinesses or, in the few instances when agricultural firms were included in a study, agribusinesses typically comprised a very small segment of subjects studied. Precisely because some
research indicates industry differences in ICT usage, researchers must delve more deeply into individual industries, sectors, and sub-sectors to understand when and how differences pertain.

For instance, in a six-year longitudinal study UK farm operators used computers and the Internet more as time passed [25]. Computer use increased from 50% in 1997 to 68% in 2003. Email use increased sevenfold and online banking increased fivefold in the six years. Similarly the study reports large increases in the use of the Internet for purchasing and for contacting customers. Interestingly, use of the Internet for farmer-to-farmer communication remained quite low over the study period. In a survey of Ohio farm operators computer adoption increased with firm size and operator education [3]. Batte [3] also found that operators from larger firms rated computer technologies used for financial recordkeeping as more useful. However, operators did not rate computers as significantly more useful when associated with Internet buying, selling, banking or information gathering. Park and Mishra [17] report that farm businesses are using the Internet increasingly more for various types of information gathering. Their results indicate that farm size, operator education level and farm diversification determine number of Internet technologies used.

2. Research Objectives

Due to the relative dearth of prior research regarding specific SME agribusiness sector-specific ICT use, the present study focuses specifically on ICT use by SME agribusinesses operating in the following industry sectors: tropical flowers, fruits and vegetables, plants and foliage, macadamia nuts and coffee (note: due to the geographical distribution of the survey, coffee growers are underrepresented in this particular survey). The ICTs of interest include email, online research, websites, and newer social technologies like instant messaging, chat, blogs, podcasts, etc. Hence, the paper examines the relationship of firm size, farm product type, and operator education to the adoption, use and evaluation of these various Internet technologies.

This study is motivated by four objectives. To begin, this study is primarily inspired by the rapidly changing nature of ICT development. This evolutionary context suggests that usage of ICTs will exhibit correspondingly dynamic patterns. For example it is likely that some ICTs will achieve quicker and more extensive diffusion than other ICTs. Thus, for research to be appropriately informed we need to capture and study pictures of the ICT environment frequently (perhaps even continuously). Toward that end this study aims first to describe, in as much detail as possible, the current state of ICT usage by SME agribusinesses in a particular geographical region. Of particular interest is determining the nature of SME agribusiness' use of the newest ICTs (e.g., instant messaging, chat, blogs, podcasts, etc.) as a baseline for future investigations.

The second objective in this study is to examine the relationship of SME size with the firm’s adoption of a variety of ICTs including computers, email, websites, online research, and several social Internet technologies as described above. This paper takes the perspective that one of the most essential factors driving ICT adoption centers on a ‘needs based’ theoretical approach. Rather than acquiring systems as a function of the availability of resources—financial, human, etc.—small firms become more motivated to obtain information technologies as they experience the need for more efficient and sophisticated information management, largely as a function of growth in size. Complexity is a function of size. In other words, larger organizations become more complex to manage, requiring more complex information capture and access strategies, entailing greater reliance on information systems.

Mintzberg [15] argues that increased size in an organization leads to more job specialization, which in turn leads to greater differentiation between units in the firm. These differences require greater attention to inter-unit coordination, with correspondingly more formalization of behaviors and hence greater formalization (structuring) of the information accompanying these behaviors. Consequently, larger business in general can be expected to require more complex information management planning, strategies, policies, and systems. Conversely, smaller firms exhibit less need for information structuring.

In addition to intra-firm coordination for operational purposes, as a business grows in size, it is also required to coordinate business functions—from order processing to accounting—with greater numbers of customers and suppliers. Growth also requires managing more employees, entailing more administrative support for functions like training. Growth in size places an increased burden in all areas of an organization’s operation for more effective and
efficient information management, which in turn results in greater likelihood of SBIS acquisition, including both Internet and non-Internet applications.

Kagan [13] reports that firm size is positively related to the sophistication of hardware and software systems used by agribusinesses. Because the Kagan study included businesses with over 500 employees, those results don’t tell us whether size affects ICT usage differently when looking at only SMEs. The present study aims to address that issue by examining SMEs exclusively.

This study’s third objective investigates whether the type of crop an SME produces bears any relationship on the firm’s decision to use the various ICTs listed. One perspective looks at differences across industries in the amount of information intensity exhibited by the primary business activities. Information intensity refers to the degree to which information is present in a business’ primary product or service. For instance, we might expect manufacturing to require more processing of information about the specifications of the product made than retail would require about merchandise sold. No significant relationship was observed between information intensity and likelihood of ICT adoption, although it was significantly related to extent of adoption [23]. One prior study showed an association between industry differences and ICT use specifically among agribusiness [13]. Additionally, different industries and industry sectors exhibit differential customer characteristics. For example, some industry sectors exhibit high growth requiring shortening life-cycles for the firms to remain competitive. This sort of innovative context can necessitate more intensive e-business engagement than with low growth sectors [8]. Thus, this study examines the relationship between crop type and ICT use specifically in agribusiness SME’s.

Lastly, this study seeks to determine whether an agribusiness operator’s education level impacts his or her firm’s ICT adoption. Because small businesses are typically highly centralized, the CEO plays an important role in all aspects of organization and operations. Such a degree of involvement and influence affects decisions to use information technologies. For example, CEO age and experience have been noted as important factors driving ICT success [18]. However, the CEO’s role in ICT adoption is not so clear-cut. For instance, CEO characteristics like knowledge of ICTs had no impact on either likelihood or extent of adoption [23]. Though it seems reasonable to assume the CEO is important in ICT adoption, research indicates that perhaps some CEO characteristics—like experience—exert more influence than others—like IT expertise. Level of end-user education is significantly related to ICT satisfaction, although no significant relationship between education level and use was found [9]. In that study however, end-users were workers in the general company population. In the current study, farm operators in smaller agribusinesses are seen as taking the role of end-users. More educated operators are more likely to have been exposed to computers during advanced education courses. More computer exposure combined with the influence an operator exerts suggests greater likelihood of computer adoption throughout the firm. Hence, computer use of all kinds is expected to increase with the farmer’s level of education. In that regard, and counter to Foong’s results, Batte [3] found that education was positively associated with computer adoption in a regional sample of agribusinesses. The present study seeks to try to reconcile the contrasting findings in the context of regional agribusinesses.

3. Method

The intent of the survey was to gauge the extent to which SME farming businesses are currently making use of or intend to make use of Internet technologies, including e-commerce, in support of their business operations. This survey is the second in a series of surveys aimed at better understanding Internet and e-business technology adoption across various sectors of Hawaii’s SME agricultural industry. By better understanding current adoption patterns and intentions, this research hopes to provide a framework for planning future educational and support services for Hawaii’s SME agribusiness.

Questionnaires were mailed out to 422 clients of USDA Agricultural Extension Services. These clients are farm businesses located on the Big Island of Hawaii including flower growers, fruit and vegetable farmers, plant and foliage growers, and those farming other crops like coffee, macadamia nuts, etc. The questionnaire was adapted from a 2001 NFIB survey and was used initially in a 2005 survey (results reported in Burke [5]). Follow up requests were mailed out several weeks after the initial mailing. Of the 422 questionnaires mailed out, 109 usable surveys were returned for a response rate of 26%.
With regard to non-response bias, it is presumed that late respondents exhibit characteristics similar to non-respondents [1]. One way to assess non-response bias is by comparing characteristics from early and late respondents. This study compared four respondent characteristics: two firm characteristics (firm size and type of product/crop sold), one farm operator characteristic (education level) and one technology characteristic (duration of website ownership). No significant differences were exhibited between late and early respondents for all four characteristics using single-tail $t$-tests at the 0.05 significance level.

Measures reported here include use of computers in the business, use of the Internet, use of email to communicate with suppliers or customers, online purchasing, online banking, online contracting, online research, ownership of a website, use of website for sales, percentage of website sales to total sales, benefits of the website (various), reasons for not developing a website, and use of social technologies (i.e., instant messaging, chat, email lists, discussion forums, blogs, podcasts, wikis). Due to the extremely small sizes of some businesses, many with just a couple of employees, this study is interested in whether they use the ICT or not, rather than the extent to which the ICT is deployed (for instance, number of employees using email) or the complexity of systems adopted (software sophistication). Therefore, all dependant variables were operationalized dichotomously—‘yes’ or ‘no’. Hierarchical logistic regression was used to test for overall model effectiveness, entering predictor variables in blocks so as to determine the incremental amounts of explained variance due to each of the variables in the model. Logistic regression is the appropriate test since the dependent variables are dichotomous. The independent variables in the regression are presented below in Table 1.

<table>
<thead>
<tr>
<th>Table 1. Independent variables entered into regression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm size (continuous)</td>
</tr>
<tr>
<td>Product type (categorical – 9)</td>
</tr>
<tr>
<td>1. Tropical flowers</td>
</tr>
<tr>
<td>2. Fruits and vegetables</td>
</tr>
<tr>
<td>3. Plants and foliage</td>
</tr>
<tr>
<td>4. Coffee</td>
</tr>
<tr>
<td>5. Macadamia nuts</td>
</tr>
<tr>
<td>6. Other</td>
</tr>
<tr>
<td>7. Tropical flowers + Fruits and vegetables</td>
</tr>
<tr>
<td>8. Tropical flowers + Plants and foliage</td>
</tr>
<tr>
<td>9. Fruits and vegetables + Plants and foliage</td>
</tr>
<tr>
<td>Education level (categorical – 5)</td>
</tr>
<tr>
<td>1. High school diploma/GED</td>
</tr>
<tr>
<td>2. Some college or an associate’s degree</td>
</tr>
<tr>
<td>3. Vocational or technical school degree</td>
</tr>
<tr>
<td>4. College diploma</td>
</tr>
<tr>
<td>5. Advanced or professional degree</td>
</tr>
</tbody>
</table>

4. Results and Discussion

Demographics

The farmers surveyed are an educated group: everyone had at least a high school diploma with over 90% having some level of education beyond high school (Table 2). Indeed, a substantial portion of these farmers (40%) possess college degrees. All of the businesses surveyed are considered small or medium sized (SME) with the vast majority being considered micro-enterprises (85%), employing ten or fewer people. Five of the firms surveyed employ more than 50 people. Most of the farmers grow tropical flowers (53%), with a large number growing plants / foliage (49%), and 11% producing fruits / vegetables. Only one farmer in this survey reported growing coffee, two reported producing macadamia nuts and 14% grow other crops. Percentages total to more than 100% since some farmers produce in multiple crop categories.
Table 2. Firm and operator demographics

<table>
<thead>
<tr>
<th>What is your highest level of formal education?</th>
<th>n = 109</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Did not complete high school</td>
<td>0%</td>
</tr>
<tr>
<td>B. High school diploma/GED</td>
<td>6%</td>
</tr>
<tr>
<td>C. Some college or an associate’s degree</td>
<td>34%</td>
</tr>
<tr>
<td>D. Vocational or technical school degree</td>
<td>9%</td>
</tr>
<tr>
<td>E. College diploma</td>
<td>40%</td>
</tr>
<tr>
<td>F. Advanced or professional degree</td>
<td>16%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Including you, how many people work in your business?</th>
<th>107</th>
</tr>
</thead>
<tbody>
<tr>
<td>=&lt; 5 people</td>
<td>70%</td>
</tr>
<tr>
<td>6 – 10 people</td>
<td>15%</td>
</tr>
<tr>
<td>11 – 20 people</td>
<td>9%</td>
</tr>
<tr>
<td>21 – 50 people</td>
<td>1%</td>
</tr>
<tr>
<td>&gt; 50 people</td>
<td>4%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Which of the following agricultural industries best describes your primary business activities?</th>
<th>n = 109</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Tropical flowers</td>
<td>53%</td>
</tr>
<tr>
<td>B. Fruits and vegetables</td>
<td>11%</td>
</tr>
<tr>
<td>C. Plants and foliage</td>
<td>49%</td>
</tr>
<tr>
<td>D. Coffee</td>
<td>1%</td>
</tr>
<tr>
<td>E. Macadamia nuts</td>
<td>2%</td>
</tr>
<tr>
<td>F. Other</td>
<td>14%</td>
</tr>
</tbody>
</table>

General Computer Use

Among SME agricultural firms, use of computers seems to be the norm. Almost all of the SMEs surveyed, 88%, report using computers in their business operations. Moreover, a third of those not currently using computers plan to start using one in the next year. Those who don’t use or plan to use computers for business generally report lack of perceived benefits of computer use (33%) or lack of technical knowledge (33%), though the absolute numbers are relatively small.

Internet Use

SME farmers in this study overwhelmingly use the Internet for business purposes (80%). Results are presented in Table 3. As with computer use, one third of SMEs not using the Internet plan to adopt its use within the next year. Internet use is an umbrella term covering such activities as email, online purchasing, online research, online banking, online bidding and of course website use. Website use will be covered more specifically in the next section.

Predictably, the most common use of the Internet is for email communication with customers and/or suppliers (91%). Email use was followed closely by business-related research (87%) and online purchasing of goods or services (83%). Interestingly about half of the SMEs responding reported conducting online financial activities, such as banking. The least reported online business activity was contract bidding, with only 12% of responding SMEs engaging in it.
In general, SME agribusinesses surveyed here have widely adopted the Internet for a variety of business-related activities. Reasons given by the 20% for not using the Internet are distributed as follows: approximately 8% see no benefit; about 4% lack appropriate infrastructure; 4% have not really thought about it; and about 2% report lack of technical knowledge. The biggest barrier preventing Internet adoption among these SMEs appears to be lack of perceived benefit. This perception may be due to several factors. For example a grower may supply only one shipper who is seen on a regular basis, rendering email unnecessary. Non-adoption may result from other reasons as well. For instance one respondent noted an intention to retire in a year, thus having no motivation to learn to use the various Internet technologies.

### Table 3. Internet use

<table>
<thead>
<tr>
<th>Are you and/or your employees using the Internet for business-related activities?</th>
<th>n = 109</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>80%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Do you expect that you and/or your employees will use the Internet for business-related activities within the next year? (If answered ‘No’ to #4)</th>
<th>n = 17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>35%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What activities does your business conduct on the Internet?</th>
<th>n = 78</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Use e-mail to communicate with customers or suppliers</td>
<td>91%</td>
</tr>
<tr>
<td>B. Purchase goods and/or services</td>
<td>83%</td>
</tr>
<tr>
<td>C. Conduct financial affairs, such as online banking</td>
<td>49%</td>
</tr>
<tr>
<td>D. Bid on contracts</td>
<td>12%</td>
</tr>
<tr>
<td>E. Gather business-related information, such as prices, new products and so forth</td>
<td>87%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Why don’t you expect to have your business use the internet within the next year? Is it because you?</th>
<th>n = 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Don’t see any benefit</td>
<td>40%</td>
</tr>
<tr>
<td>B. Cost of service is too high</td>
<td>0%</td>
</tr>
<tr>
<td>C. Don’t know how to do it</td>
<td>10%</td>
</tr>
<tr>
<td>D. Haven’t really thought about it</td>
<td>20%</td>
</tr>
<tr>
<td>E. Infrastructure not yet available</td>
<td>20%</td>
</tr>
</tbody>
</table>

**Web Site Ownership**

While most SMEs surveyed employ the Internet in the conduct of various business activities, far fewer own websites. In fact, only 30% of these agribusinesses reported having a website (Table 4). While this percentage may seem low given the constant media hype about website use, the extent of adoption reflects fairly closely website ownership rates found in an examination of national survey data [5]. That study found about 35% of all small businesses reported having a website. Among the website owners in the current study, over two thirds of them have owned their website for more than four years, suggesting that these website owning farmers have been on the leading ICT edge for a while.

### Table 4. Website ownership

<table>
<thead>
<tr>
<th>Does your business have a web site?</th>
<th>n = 109</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>30%</td>
</tr>
</tbody>
</table>
How many months has your web site been operating?  

<table>
<thead>
<tr>
<th></th>
<th>n = 32</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 year</td>
<td>6%</td>
</tr>
<tr>
<td>1 – 2 years</td>
<td>9%</td>
</tr>
<tr>
<td>2 – 3 years</td>
<td>13%</td>
</tr>
<tr>
<td>3 – 4 years</td>
<td>3%</td>
</tr>
<tr>
<td>4 – 5 years</td>
<td>16%</td>
</tr>
<tr>
<td>5 - 10 years</td>
<td>47%</td>
</tr>
<tr>
<td>&gt; 10 years</td>
<td>6%</td>
</tr>
</tbody>
</table>

When those SME’s not having a website were asked whether they would develop one in the next year, 24% said yes and 34% indicated a possibility. Interestingly, a substantial number (42%) said they do not intend to develop a website in the next year.

In this survey the majority of SMEs reported not owning a website. The most common reasons cited for not owning a website were: haven’t gotten around to it – 39%; lack of technical knowledge – 37%; product/service not suited to website sales – 33%; and the time required to develop and maintain a website – 26%. Cost was an issue for 13% of respondents. Approximately 11% of SME’s owners reported not seeing enough potential benefit in owning a website. About 9% reported lacking appropriate infrastructure, while 9% indicated that the degree of online competition discouraged investment. In general, the dominant impediments to website ownership appear to be motivational, technical knowledge, and perceived lack of suitability of the SME’s product for website commerce. A thread common among these factors is their informational aspect. Thus, it is possible that better educational and consultancy programs could overcome the motivational, knowledge and perceptual biases agricultural SME’s exhibit toward website ownership.

Web Site Use – Sales, Income and Perceived Benefits

Historically, strategic organizational information technology issues have largely been seen from a transaction-based perspective. For example, Bergeron and Raymond [4] presented a matrix of information systems for competitive advantage (ISCAs) which referred to suppliers, competitors and clients as targets of information used for strategic activities. Similarly, e-commerce has been seen from a transaction perspective. Researchers have described ecommerce business models as business-to-consumer (B2C), business-to-business (B2B), consumer-to-business (C2B) or consumer-to-consumer (C2C). Bailey and Bakos [2] categorize electronic markets into industrial (B2B) or consumer (B2C). This sort of approach suggests that information management is critical to facilitate transactions between a firm and its buyers and suppliers. The above approach to IS draws largely on the transaction cost theory of the firm, developed by organizational economists, such as Williamson [26] to explain how internalizing market functions can help firms gain competitive cost advantage.

It follows then that it is important to understand how SME’s use websites and what benefits owning a website can generate. In this study, two-thirds of firms owning a website (22% of all firms) report selling goods or services via the website (Table 5). For many, owning a website leads to substantial trade with other business partners (the B2B ecommerce model). For example, a sizable number of SMEs with websites, about half, report that website sales to other businesses reflect more than 10% of their total firm sales. Indeed, for almost a quarter of them their website sales to business partners constitute more than half of total sales.

Similarly, owning a website appears to bring substantial revenue benefits as well. For instance, half of those with websites report that their website sales constitute more than 10% of total firm revenues. A full 35% of them report that website sales reflect 25-50% of total revenues. Some (about 8%) indicated that website sales were more than 50% of their overall sales. Expectations for website sales a year from now appear stable across SME’s. In other words, respondents indicated that the current website-to-total-sales ratios would continue in the near future.

Websites can generate revenues directly, via website sales as discussed above, or indirectly. SMEs in the current study reported a number of revenue channels in addition to direct sales as a result of their websites. For instance, 90% of website owners reported sales stimulated by the website but transacted via phone, fax or email. About half of
SMEs here also reported that their website stimulated people to come into the place of business to buy products. Additionally, a small number (10%) make money from advertisements on their website.

**Table 5. Website sales**

<table>
<thead>
<tr>
<th>Do you sell goods or services directly over the website?</th>
<th>109</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>22%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Approximately what percentage of your internet sales are to other businesses?</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 10%</td>
<td>50%</td>
</tr>
<tr>
<td>10 – 25%</td>
<td>11%</td>
</tr>
<tr>
<td>26 – 50%</td>
<td>17%</td>
</tr>
<tr>
<td>51 – 75%</td>
<td>6%</td>
</tr>
<tr>
<td>&gt; 75%</td>
<td>17%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Approximately what percent of your CURRENT total sales do you make, directly or indirectly, as a result of your website?</th>
<th>n = 23</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 10%</td>
<td>39%</td>
</tr>
<tr>
<td>10 – 25%</td>
<td>17%</td>
</tr>
<tr>
<td>26 – 50%</td>
<td>35%</td>
</tr>
<tr>
<td>51 – 75%</td>
<td>4%</td>
</tr>
<tr>
<td>&gt; 75%</td>
<td>4%</td>
</tr>
</tbody>
</table>

It is important for SME owners and managers to be able to identify strategic benefits from their IT investments. For example, does an investment in a technology help generate an increase in a firm’s market share? Or can the investment make a firm’s business processes more efficient? These are questions that SME owners must ask when assessing the potential and actual benefits from a costly investment in IT, like developing a website. Results from the current study suggest that a number of significant strategic benefits accrue to SME agribusiness website ownership. For instance, a substantial number in the current study (80%) say their website has brought them additional customers (Table 6). Significantly, two thirds indicate that the website has brought them new types of customers, types not typically attracted to their traditional location. Most websites (73%) have generated an increase in total sales for their firms.

As pointed out at the beginning of this section, a major claim for ecommerce is the potential to reduce transaction costs. Indeed, 20% of firms here reported a reduction in costs per unit sold. More generally, 37% of firms report increased profits and 20% say their website has increased their sales in the international arena. Finally, the majority of SMEs owning a website (53%) indicate that their overall competitive position has improved because of their website. Evidence suggests that SME agribusiness owners who choose to invest in a website realize significant benefits generated from the site, and, more importantly, recognize those benefits.

**Table 6. Website Income and Benefits**

<table>
<thead>
<tr>
<th>Does the website produce income for your business through?</th>
<th>n = 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Sales stimulated by the site, but made over the telephone, fax or e-mail</td>
<td>90%</td>
</tr>
<tr>
<td>B. Sales stimulated by the site, but made in your place of business</td>
<td>50%</td>
</tr>
<tr>
<td>C. Ads on your site</td>
<td>10%</td>
</tr>
<tr>
<td>D. Paid subscriptions to the material on your site</td>
<td>0%</td>
</tr>
<tr>
<td>E. Commissions for directing business to another site</td>
<td>0%</td>
</tr>
</tbody>
</table>
To date, what benefits has your business experienced from your website? Has it?

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Increased your total sales</td>
<td>73%</td>
</tr>
<tr>
<td>B. Brought you additional customers</td>
<td>80%</td>
</tr>
<tr>
<td>C. Brought you new types of customers</td>
<td>67%</td>
</tr>
<tr>
<td>D. Reduced your costs per unit sold</td>
<td>20%</td>
</tr>
<tr>
<td>E. Increased business profits</td>
<td>37%</td>
</tr>
<tr>
<td>F. Increased sales outside the United States</td>
<td>20%</td>
</tr>
<tr>
<td>G. Improved your competitive position</td>
<td>53%</td>
</tr>
</tbody>
</table>

The overwhelming majority (67%) say that their products or services are not suited to selling on the site. Some report that they have not gotten around to it yet (25%), while a few (17%) indicate that the cost is too high. So, while most websites generate sales with corresponding profits and benefits for their owners, some SMEs own websites to advertise their business or product but don’t conduct transactions via the site. Generally most agribusiness SMEs that fall into this latter group feel that although the Internet is good for marketing, their product is not suitable for online selling.

**Social Technologies**

Steinfield [21] argues that technology-based systems need to incorporate social processes. Huysmann & Wulf [10] go so far as to argue that electronic networks cannot survive without a corresponding and co-existing social network. Some suggest that members in a community of practice learn through participation in that community and that the boundaries of the community are determined by the task(s) the members share in common, the culture, and the history of the community [25]. Members in the community share their understanding and expertise with other members, embedding knowledge in the network for later re-use and reconstruction as a resource in problem solving. This new approach to knowledge management has been characterized as a community networking model, envisioning a task-oriented community where knowledge is not so much processed as it is continuously re-created and re-constructed through dynamic, interactive, and social networking activity [22]. This perspective in business suggests the need for SME agribusinesses to adopt and use a variety of emerging social networking technologies. Because standard point-to-point email has been available for decades and because of its relative prevalence, we examine its use separately. For our discussion regarding the use of newer emerging social networking technologies we include instant messaging, chat, email lists, online forums, blogs, podcasts and wikis (online information repositories where primarily text-based content is created by contributing visitors).

Results from the present study indicate that some agribusiness SMEs use some of the newer social technologies (Table 7). With the exception of email lists however, the extent of social technology adoption is relatively minimal at this date. Responses indicate that email lists are used by 43% of SMEs in this study. The other social technologies are used by only a few firms. The percent of all survey respondents reporting usage of a social technology are as follows: instant messaging – 8%; chat – 7%; online discussion forums – 9%; blogs – 4%; podcasts – 4%; and wikis – 1%. Significantly, almost half of the firms (47%) report using none of the technologies. In other words, a very small number of SMEs here use a variety of social technologies, while many use none. Quite a few, however, do use email lists.

**Table 7. Social technologies**

<table>
<thead>
<tr>
<th>Technology</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Instant messaging</td>
<td>8%</td>
</tr>
<tr>
<td>B. Chat</td>
<td>7%</td>
</tr>
</tbody>
</table>
Firm Size, Product Type and Operator Education

Results from this study indicate that firm size impacts some ICT adoption but has no apparent effect on the adoption of others. Results show firm size is significantly associated with the use of computers in business, owning a website, and the use of a number of social ICTs. Table 8 below presents results from selected regressions for firm size. The informative statistic to look at when interpreting logistic regression results is the $\exp(B)$. This statistic is an indicator of the change in odds of a dependent variable value occurring as a result of a unit change in the predictor variable. For example, the odds of a larger business using a computer are about four times greater than a smaller business ($p=.01$, $\exp(B)=3.96$). These results are consistent with earlier research, e.g., [3] [17]. Website ownership also appears to vary depending on firm size. In this study, the odds of a larger farm owning a website were almost 20% higher than the odds of a smaller farm owning one ($p=.01$, $\exp(B)=1.18$). This result is consistent with earlier conclusions that larger firms are more likely to adopt more sophisticated applications than smaller ones [12].

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>Wald statistic ($p$-value)</th>
<th>Cox &amp; Snell $R^2$</th>
<th>Nagelkerke $R^2$</th>
<th>$\exp(B)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use computer for business</td>
<td>6.83 (.01)*</td>
<td>.33</td>
<td>.64</td>
<td>3.96</td>
</tr>
<tr>
<td>Use Internet for business</td>
<td>2.30 (.12)</td>
<td>.21</td>
<td>.37</td>
<td>1.21</td>
</tr>
<tr>
<td>Activities conducted on Internet:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email</td>
<td>2.25 (.13)</td>
<td>.23</td>
<td>.51</td>
<td>1.54</td>
</tr>
<tr>
<td>Purchase goods / services</td>
<td>.17 (.68)</td>
<td>.20</td>
<td>.33</td>
<td>1.02</td>
</tr>
<tr>
<td>Financial affairs</td>
<td>.86 (.35)</td>
<td>.20</td>
<td>.27</td>
<td>1.02</td>
</tr>
<tr>
<td>Bid on contracts</td>
<td>1.82 (.17)</td>
<td>.23</td>
<td>.45</td>
<td>1.04</td>
</tr>
<tr>
<td>Business-related research</td>
<td>1.55 (.21)</td>
<td>.16</td>
<td>.29</td>
<td>.96</td>
</tr>
<tr>
<td>Website ownership</td>
<td>5.55 (.01)*</td>
<td>.33</td>
<td>.45</td>
<td>1.18</td>
</tr>
<tr>
<td>Duration of website ownership</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(univariate regression)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sell via website</td>
<td>0.47 (.48)</td>
<td>.44</td>
<td>.63</td>
<td>1.09</td>
</tr>
<tr>
<td>Use following social technologies:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instant messaging</td>
<td>4.37 (.03)*</td>
<td>.10</td>
<td>.24</td>
<td>1.05</td>
</tr>
<tr>
<td>Chat</td>
<td>4.06 (.04)*</td>
<td>.13</td>
<td>.34</td>
<td>1.06</td>
</tr>
<tr>
<td>Email lists</td>
<td>4.46 (.03)*</td>
<td>.24</td>
<td>.33</td>
<td>1.11</td>
</tr>
<tr>
<td>Online discussion forums</td>
<td>0.17 (.67)</td>
<td>.03</td>
<td>.13</td>
<td>.96</td>
</tr>
<tr>
<td>Blogs</td>
<td>2.76 (.09)**</td>
<td>.16</td>
<td>.57</td>
<td>.35</td>
</tr>
<tr>
<td>Podcasts</td>
<td>0.50 (.47)</td>
<td>.11</td>
<td>.40</td>
<td>.82</td>
</tr>
<tr>
<td>Wikis</td>
<td>na</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None of these social technologies</td>
<td>4.28 (.03)*</td>
<td>.24</td>
<td>.32</td>
<td>.88</td>
</tr>
</tbody>
</table>

* significant at $\alpha = .05$
** significant at $\alpha = .10$
Kagan’s results also suggest that larger firms should be more likely to develop more sophisticated and hence more complex websites. For example, larger firms would be expected to evolve from having a brochure-ware site that merely informs visitors to developing a site that allows the visitor to purchase the product. Interestingly, while firm size was found to affect website ownership in this study, size was not related to whether or not a firm sells its product via the website. There were no significant differences between smaller and larger farms in their decision to sell product from their web site.

Other results from the current study also contrast with those from earlier reports. For example prior studies suggest that ICT use is influenced by product type [23] and operator education [3]. In this study, neither product type nor operator education level significantly impacted adoption of any of the ICTs examined here. A look at the demographics may help explain current results. With respect to product differences, in this study most firms produced flowers (cut and potted), fruits and vegetables, or plants. Although these products appear quite different, their market characteristics (e.g., distribution channels, customer segment, etc.) share commonalities that make them less different than when comparing other producer/grower firms like grain or seed. Channel and customer characteristic differences become more pronounced when comparing diverse sectors like livestock, food processors and professional agricultural services. For example, Fillis et al. [8] suggest that firms in high-growth and short-life-cycle industry sectors are expected to exhibit greater degrees of e-commerce adoption in order to remain competitive. In other words, it is important to understand sector differences and their potential role in determining ICT usage differences when trying to compare and generalize ICT use characteristics. The fact that there were no differences in ICT use across the product types in the current study likely reflects homogeneity in important market characteristics.

Similarly, results obtained in this study indicate that different levels of farm operator education do not result in different patterns of ICT use. Indeed, none of the ICT usage factors studied here was significantly associated with changes in education level. High school graduates were no less or more likely to use the internet, have a website, sell via the website, or use any of the social technologies than were operators with some college or those with college degrees. This result appears counter to Batte’s [3] conclusion that operators with some post-high school education were more likely to use a computer. Current results indicate education does not impact ICT use while Batte’s results suggest education does matter. Why the different conclusions? For one thing, it is not clear whether Batte’s study included farmers who had not graduated high school. For instance, if the Batte study included high school dropouts, the educational levels would contrast more than in the present study where everyone had a high school degree. In other words, education could still matter but the greater homogeneity in education level achieved among farmers in the current study could be mitigating that relationship somewhat. Still, operators in the current study exhibited various levels of education, including some college, college degrees and even some graduate work, but nonetheless did not differ in ICT use. Another perspective is that as education level increases, the impact of education on ICT adoption may become less influential, giving way to the pressure of other more critical factors like firm size or product type.

Finally, it is worth pointing out that a number of other subsidiary ICT factors were examined. Aside from the specific issues discussed above, the survey solicited information about website sales as a percent of total sales, perceived benefits of the website (followed by a list of potential benefits), reasons for not having a website, and reasons for not selling via the website. For all of these dependent measures there were no differences observed among firms of different sizes, among firms in different product categories, or among firms whose operators had more education. For example, when asked what benefits their website had brought them, 80% of respondents reported it bringing new customers, 73% reported bringing additional sales, and 67% reported the website bringing in new types of customers. Regardless of firm size, product type or operator education, the firms all enjoyed these benefits equally. The same was true for the rest of the measures as well. None of the three factors of interest had any impact on any of the subsidiary measures in this study.

5. Conclusions and Implications

This study extends our knowledge about ICT adoption factors among SME agribusinesses in several respects. Much of the body of SME research to date has not looked specifically at agribusiness. Additionally, relatively few agribusiness studies examining ICT use have been produced recently. This study reports results from data captured
in late 2007; hence the results paint a very current picture of ICT use among farmers. Moreover, the current study focuses very particularly on a narrow agricultural sector: primarily targeting tropical flowers, fruits and vegetables, and plants / foliage, and to a lesser extent coffee and macadamia nuts. While this narrow focus can be considered a limitation of the study, it is also a strength in that we have surveyed a large portion of these specific sectors in this region. Generalizing these results would probably best be done when looking at agricultural markets that exhibit similar characteristics across several dimensions, including product type, customer type, and market structure. For example, it might be possible to compare website usage here to usage among farmers who grow products that, like flowers, require quality control, are perishable, can be shipped, can be sold directly to consumers, but can also be consolidated through grower-shippers. With appropriate channel and market consideration, the results presented in this paper can be useful in assessing technology issues in other agricultural sectors as well.

A related contribution of this paper is that results here suggest that a different and more coherent picture of ICT use emerges when looking at specific industry sectors and product types rather than lumping all types together as most prior studies have done. Past studies have indicated differences in ICT use across industry and product types. Results here indicate homogeneity in ICT use among product sectors exhibiting similar channel or market characteristics. Future research needs to look more closely at identifying pertinent channel and market factors.

While this study suggests that firm size does matter in the adoption and use of ICTs, firm size is likely only one of a number of factors, including technical and social characteristics. For instance, although we observed differences among firms in the adoption of emerging social ICTs, this study did not consider the role of social networking among SME farm operators as an adoption driver. Nor does this study explore ICT use factors after adoption. For example, while firm size affects ICT adoption, other factors like investment in human resources and organizational support (including financial resources) may be critical to the ongoing success of the ICT [19]. Researchers should investigate those kinds of issues among agribusiness SMEs as well.

Results here have implications for practitioners as well. Mehtrens, Cragg and Mills [14] found that, among other factors, SMEs adoption of Internet technologies is significantly driven by perceived benefits and pressure by customers and suppliers. Small farm operators can see that their competitors are using the Internet for business enhancements. Thus, farm operators need to understand why and how they too can use ICTs for their own benefit. In general, farmers in the product sectors studied here used computers and the internet for business activities. The most common online activities are email, business-related research, purchasing, and conducting financial affairs. While most farmers use the Internet, far fewer (only about 30%) have progressed to the use of websites, with only a third of those using their websites to sell their products. Farmers who don’t have a website or don’t sell via the site generally don’t think their product is suited to online business or else don’t perceive enough benefit. Those who do have websites and / or do sell from them generally report benefits in the form of more customers, more sales and more profits.

A major contribution of this study is that it also assessed the use of several emerging ICTs – technologies whose use in SME agribusinesses have not yet been studied. Results show that farm operators are beginning to use these newer ICTs. For example the study found that instant messaging, chat, online discussions and even blogs and podcasts are used by a small number of farm operators. Significantly, results indicate that almost half of SME operators do not use any of the emerging ICTs. The results observed here provide a baseline for future studies of SME agribusinesses (especially for emerging ICTs) and offer motivation for farm operators to continue exploring ICT use.

References


Abstract

In a crisis all rescue forces, government agencies, volunteers, and business sectors work together to supply immediate relief efforts. The problem of the lack of a shared platform or similar communication methods among the collaborators usually arises within a few hours. The paper presents an outline of an ontology model for the construction of a common platform for sharing different concepts in different languages and coordinating rescue forces. Motivation is supplied by the Boxing Day Tsunami crisis.

Keywords: Crisis, multilingual knowledge, ontology

1. Ontologies and Multilinguality

Ontologies are currently considered the de-facto standard for representing semantic information. Their design, however, is a difficult task, requiring the collaboration of ontology engineers and organization experts. Therefore, ontologies are manually crafted and tuned, which results in a static domain model, infrequently modified. Nevertheless, once designed their universal nature makes them an excellent mechanism for application interoperability.

A common definition of an ontology considers it to be “a specification of a conceptualization” (Gruber, 1993), where conceptualization is an abstract view of the world represented as a set of objects. The term has been used in different research areas, including philosophy (where it was coined), artificial intelligence, information sciences, knowledge representation, object modeling, and most recently, eCommerce applications. For our purposes, an ontology \( O \equiv (V, E) \) is a directed graph, with nodes representing concepts (vocabulary or things (Bunge, 1977), (Bunge, 1979)) associated with certain semantics and relationships (Russell and Norving, 2003). For example, a crisis concept can be Supply Chain which will be associated with both the concept of Management and the concept of Food Aid, as displayed in Figure 1.

The static nature of ontologies conflicts with the dynamic nature of the world. Businesses often change and need to adapt the semantic representation of their occupations to the changing business environment. Governments, which change less often, still need to adapt their regulations to a global community, while maintaining some divergence from standard governance, reflecting local interpretations and lingual differences. An emergency incident requires collaboration among all these organizations with rescue and support forces within a limited timeframe. The research literature has proposed a hybrid approach, in which ontologies are recognized as static entities yet an organization can change its business semantic representation dynamically. To do so, an ontology is defined to have two parts: a static part (which is the global ontology) and a dynamic part, which evolves either by exporting ontologies or by discovery. With such a model, organizations can still interoperate using the universal part of the ontology and continuously change their business models using the local component of the ontology.

In the quest to identify frameworks, concepts, and models for crisis ontologies the term 'Open Ontology' was addressed in (Di Maio, 2007). 'Open Ontology' refers to a given set of agreed terms, in terms of conceptualization and semantic formalization, that has been developed based on public consultation. Previous efforts to utilize ontology for crisis response include the OpenKnowledge system, which supports and enhances the sharing and effective use of information and services among different actors (Vaccari et al., 2006). Previous work also focused on blogs and the collaborative tagging approach (Ziesche, 2007). However, the present work takes ontology for crisis management further and enables real-time extension of the ontology.

An ontology-based model for multilingual knowledge management in information systems has been proposed in (Segev and Gal, 2008). The unique feature was a lightweight mechanism, dubbed context, which is associated with ontological concepts and specified in multiple languages. The contexts were used to assist in resolving cross-language and local variation ambiguities.
The technique presented here is different from the previous model since it requires the ability to create and modify the ontology in real-time as the crisis arises and continues to evolve. This requirement necessitates having a basic predefined multilingual ontology while allowing the expansion of the ontology according to the crisis circumstances and the addition of other languages within the crisis time limitations. The technique can be adopted to build an ontology where each concept can be represented in multiple languages and can be expanded for use in crises, such as the Boxing Day Tsunami.

The Sphere handbook (Sphere Project, 2004) is designed for use in disaster response and is applicable in situations where relief is required, including natural disasters and armed conflict. It is designed for use in slow- and rapid-onset situations, rural and urban environments, developing and developed countries, anywhere in the world. Analysis of the Sphere handbook index shows that it meets many requirements of an ontology. Thus, the current index can be defined as an Index Ontology. The Sphere Handbook was translated into 37 languages. Thus it supplies a top level ontology that can be used concurrently in multiple languages. Since each high level Index Ontology concept is represented in multiple languages, there is faster ontology adaptation in crisis situations. A sample of a multilingual ontology in English, French (F), Tamil (T), and Sinhala (S) is presented in Figure 1. In addition, the top level ontology can be expanded according to the specific emergency using additional resources, for example, an index from a relevant book such as a medical manual, or Web sites, such as Wikipedia.

2. Utilizing the Knowledge Ontology

The question arises of how the Index Ontology can support agencies and groups involved in a crisis. The answer can be divided into two separate tasks: to enable the information flow during the crisis to be matched with relevant ontology concepts and to direct the relevant information to the correct agency or individual. The ontology matching process directs the crisis information flow to the relevant ontological concepts. The crisis might include multiple types of information such as documents, emails, blogs, and update postings in message boards. The Index Ontology can serve as a knowledge base for directing crisis information flow. An information system deployed in a crisis can use the Index Ontology as an immediate knowledge representation that can be accessed by emergency forces. Civilians in a...
crisis can access such a system to link to relevant information or to provide real-time information that will be matched immediately with concepts predefined in the ontology. This ontology can be set up in the initial time frame of the crisis allowing information to be sent in multiple languages using the same framework. The example of the Boxing Day Tsunami shows the relevance of such an ontology. For instance, an email or a blog web-site requesting food aid in the civilians’ local language such as Tamil or Sinhala could be collected with all of the incoming Food Aid requests from all of the crisis locations to the relevant concept. Consequently, management teams can make decisions based on the information associated with the Management concept and its related concepts (Figure 1).

Experiments are underway to analyze the ability to map relevant crisis information based on the Index Ontology. Blogs posted during the Katrina and South Asia earthquake crises are being used to analyze information flow based on the multilingual ontology. An application which utilizes the ontology is currently being developed based on these postings.

References

A QoS-Based Services Selected Method in Service-Oriented Architectures Using Ant Colony System - A Case Study of Airflights

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Abstract
Semantic web is becoming more and more popular these days, and it’s an opportune moment to look at the field’s current state and future opportunities. However, most researchers focus on only one single service recommend from semantic web inference. In some situations, the Multi-Services which are combined many complex services from various service providers are better than single service. The designed Multi-Services Semantic Search System (MS4), which provides the cooperation web-based platform for all related mobile users and service providers, could strengthen the ability of Multi-Services suggestion. In this research, MS4 chooses the adaptable airflight as a case study. MS4 is a five-components system composed of the Mobile Users (MUs), UDDI Registries (UDDIRs), Service Providers (SPs), Semantic Web Services Server (SWSS), and Database Server (DS). Using SOA, OWL-S to build semantic web environment to inference user’s requirements and search various web services which are published in UDDI through the communication networks include internet and 3G/GPRS/GSM mobile networks. In this airline case, we propose the Adaptive Airflights Inference Module (AAIM) combined QoS-Based Services Selected Method (QBSSM) using Ant Colony System (ACS) to reference the adaptable airflights to MUs.

Keywords: Web Services, Service-Oriented Architecture, QoS-Based Services Selected Method, Fuzzy Theory, Ontology.

1. Introduction
Semantic web is becoming more and more popular these days, and it’s an opportune moment to look at the field’s current state and future opportunities. A semantic web can be though of as a web that is highly intelligent and sophisticated and one needs little or no human intervention to carry out tasks such as adaptable air fight collocation, scheduling appointments, coordinating activities, and searching for complex documents as well as integrating various databases and information systems.

Recently there have been many developments on recommendation model for the semantic web. For inference user’s requirement to recommend, the semantic web possibly combines Service-Oriented Architecture (SOA, includes UDDI (Universal Description, Discovery and Integration), SOAP (Simple Object Access Protocol), WSDL (Web Services Description Language)) with RDF (Resource Description Framework), DAML (DARPA Agent Markup Language), DAML-S, DAML+OIL, OWL (Web Ontology Language), OWL-S, or etc. [2, 3, 8]. However, most researchers focus on only one single service recommend from semantic web inference. The single service is mean only one service which maybe a complex-service but provided by the same one. In this airline case, the single service is like making one airflight ticket reservation to Airline Company. In some situations, the Multi-Services which are combined many complex services from various service providers are better than single service. For example, to make a set of airflights tickets (such as Multi-Services, which possibly need some turning points) reservation is cheaper than make only one airflights ticket reservation.

The need for Multi-Services recommend in semantic web is driven by three demands.
(i) To inference user’s requirements by semantic engine.
(ii) To search, compare, reorganize, and integrate relevant web services to be Multi-Services.
(iii) To reduce query processes and time.

This paper provides an overview of the Multi-Services recommend in semantic web, combines the technical application of the SOA, OWL-S, semantic web on information system, the system gives strong auxiliary utility to support users while they have some complex problem. The designed Multi-Services Semantic Search System (MS4) is a five-components system composed of the Mobile Users (MUs), UDDI Registries (UDDIRs), Service Providers (SPs), Semantic Web Services Server (SWSS), and Database Server (DS). Using SOA, OWL-S to build semantic web environment to inference user’s requirements and search various web services which are published in UDDI through the communication networks include internet and 3G/GPRS/GSM mobile networks. In this airline case, we propose the Adaptive Airflights Inference Module (AAIM) combined QoS-Based Services Selected Method (QBSSM) using Ant Colony System (ACS) to reference the adaptable airflights to MUs.
The remainder of the thesis is built as follows. In Section 2 we provide background knowledge through the
description of related technologies, such as the concept of Semantic Web (SW), fuzzy logic, and Ant Colony
System (ACS), and the discussion about the current methods for Multi-Services searching. The complete
framework we proposed is explained in Section 3. In Section 4 will illustrate how we implement the architecture
for Airline service as an example in our proposed framework. Finally conclusion and the future work are given in
Section 5.

2. Research Background and Theory Discussion

Design Multi-Services Semantic Search System (MS^4) is to provide (i) user’s requirement inference, (ii)
Multi-Services decision support, (iii) searching and inference performance. Necessary research background and
relevant technology include as follows: (1) Semantic Web (SW), (2) fuzzy theory, and (3) Ant Colony System
(ACS).

2.1 Semantic Web (SW)

To solve the problem of lacking effective service query mechanism in existing web services, a Semantic Web (SW)
based technology based web services query mechanism was proposed by Tim Berner-Lee whose proposed vision
[10] is shown as Fig. 1. In this paper, we focus on (1) semantic inference and (2) system performance described as
follow.

![Figure 1. Semantic Web Stack [10]](image)

2.1.1 Semantic Inference

For inference user’s requirement semantically, Ora Lassila and James Hendler [8] proposed a architecture of SW
applications based on RDF, with patterns in which one component uses another as a data source (via SPARQL)
and acts as a data source to yet another component. However, RDF and RDF schema provide properties and
syntax not completely to build ontology architecture. In this paper, we use the OWL-S which is an OWL-based
Web service ontology that supplies web service providers with a core set of markup language constructs for
describing the properties and capabilities of Web services in unambiguous, computer-interpretable form.

2.1.2 System Performance

For efficient selection of QoS-aware web service, in reference [5], we can know the inquiry API of JUDDI has
better performance than JWSDP (Java Web Services Development Pack). And there were some approaches
proposed by reference [7, 13], which used “cache” mechanism for reducing process and queries while service
broker inferences QoS-aware web services. Therefore, we choice JUDDI to build MS^4 with “cache” mechanism
to provide SW services.

2.2 Fuzzy Theory

The Theory of fuzzy set is proposed on the basis of the classical set theory. A fuzzy set is a set with the boundary
between 0 and 1. Unlike classical set theory, the value of fuzzy set isn’t just 0 or 1. It is a smooth boundary for the
fuzzy set theory. We review S-membership function [1](shown as Fig. 2) for representing the proposed algorithm
in Section 3.4.2.

\[
\mu_s = \begin{cases} 
0 & , a < b \\
\left(\frac{a-b}{d-b}\right)^2 & , b \leq a \leq c \\
1 - \left(\frac{a-b}{d-b}\right)^2 & , c \leq a \leq d \\
1 & , a \geq d 
\end{cases}
\]
2.3 Ant Colony System (ACS)

The complex social behaviors of ants have been much studied by science, and computer scientists are now finding that these behavior patterns can provide models for solving difficult combinatorial optimization problems. Ant Colony System (ACS) consists of a set of cooperating agents called ants that cooperate to find a good solution for optimization problem on graphs similar to the Travel Salesman Problem (TSP, such as this airflights case). Each single ant reflects a very trivial behavior: it simply goes from a node to another across an arc, but when all ants cooperate, like actual ants do in a real colony, the whole system reveals an intelligent behavior, as much as it is able to find a good solutions for the TSP [12].

To compare the ACS with Dijkstra algorithm and Artificial Neural Network (ANN) is shown as table 1. The Dijkstra algorithm is a divergent function and can’t input various arguments to inference. ANN [11] is a strong convergence function and can support inference by many arguments, but it is inadaptable in dynamic environment such as this airflights case. In this case, the weather sometime becomes bad accounted for cancelling the airflights.

<table>
<thead>
<tr>
<th></th>
<th>ACS</th>
<th>Dijkstra</th>
<th>ANN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various Arguments</td>
<td>O</td>
<td>X</td>
<td>O</td>
</tr>
<tr>
<td>Dynamic Environment</td>
<td>O</td>
<td>O</td>
<td>X</td>
</tr>
<tr>
<td>Strong Convergence</td>
<td>O</td>
<td>X</td>
<td>O</td>
</tr>
</tbody>
</table>

3. Systematic Structure

The Multi-Services Semantic Search System (MS$^3$) is a five-tier system, shown as Fig. 3, Mobile Users (MUs) can utilize various terminal devices that include PC, notebook, Tablet PC, Personal Digital Assistant (PDA), and mobile phone to access Semantic Web Services Server (SWSS) through various web browsers. The UDDI Registries (UDDIRs) such as JUDDI offer UDDI standard APIs which are Inquiry API and Publication API for Service Providers (SPs) and SWSS (as Service Requests). SPs are many kinds of various businesses which provide some services to publish to UDDIRs. There are Intelligent Agents (IAs), Model Base System (MBS) in the SWSS. There is the collecting of user’s requirement information, geographical information, and multimedia's file in the database server. Relevant system functions design as follows.

3.1 Mobile Users (MUs)

Mobile users (MUs) provide the functions that include Adaptable Multi-Services (AMS), Customized Service, Heterogeneous Networks.

3.1.1 Adaptable Multi-Services (AMS)

MUs use mobile device to request their requirements to MS$^3$, in order to carry on the inference of Multi-Services by SWSS using MBS and Semantic Inference Module (SIM). In this airline case, Offering relevant adaptable air flights to users who can choose difference routes in accordance with their situation (such as cost-oriented or time-oriented), and MS$^3$ makes reservation automatically according user request. Model of MBS depend on Semantic Inference Module (SIM), Adaptive Airflights Inference Module (AAIM), and other extesion module to estimate. The SIM inference user’s requirement and calculate QoS cost of web services (such as price-cost or time-cost) by Fuzzy logic. The AAIM offers QoS-Based Services Selected Method (QBSSM) using Ant Colony System (ACS) to provides adaptable air flights (such as multi-services) on different user’s situation by QoS cost of web services (as cost of every section).

3.1.3 Heterogeneous Networks (HN)

Users use in the different network protocol, so the designing of system lets the terminal device or mobile equipment can be integrated services such environments as GSM, GPRS, IEEE802.11x wireless network, etc..

3.2 UDDI Registries (UDDIRs)

The aim of semantic web is to locate services automatically based on the functionalities Web services provide. UDDI is helpful to discovery Web services with semantic web. Therefore, we use the JUDDI to build UDDI environment which provides Business Entities, Service Entities, Binding Templates, and tModels to represent the detail of business and its services. Services in JUDDI can be searched by name, by location, by business, by bindings or by tModels. However, JUDDI doesn’t support any inference based on the taxonomies referred to by the tModels. Integration of semantic web and JUDDI will solve this problem.
In order to inference user’s requirement semantically, Anton Naumenko, Sergiy Nikitin, Vagan Terziyan and Jari Veijalainen propose the mapping method of transforming subject-predicate-object triples of OWL-S into tModels, which is shown in Fig. 4. After mapping, Service Retrieval Agent (SRA) can retrieve the detail and relationship of those services in JUDDI by UDDI4J APIs for the semantic inference easier.

3.3 Service Providers (SPs)

Service Providers (SPs) build SOAP environment such as AXIS2 to provider some services for user invocation. After building services, SPs can publish the information of business, services, and binding templates to UDDIRs. For security, we can modify the AXIS2 API (such as upload.jsp) to build the hash code of service by MD5 algorithm. In this airline case, SPs which can publish the air flight service to UDDIRs through heterogeneous networks are China Airline, Far Eastern Air, and etc..

3.4 Semantic Web Services Server (SWSS)

The Semantic Web Services Server (SWSS) offers the relevant services of multi-services semantic search, those services compose of the Intelligent Agents (IAs) and Model Base System (MBS).

3.4.1 Intelligent Agents (IAs)

The IAs proceed such function as collection of the materials, searching, classifying, dealing with work, etc., the work can let users get the most multi-services automatically. The intelligent agent system includes User Interface
Agent (UIA), User Requirement Agent (URA), and SRA.

1. **User Interface Agent (UIA)**
To know that user’s equipment type, when the users login in and give them the proper webpage.

2. **User Requirement Inference Agent (URIA)**
To collect the user’s requirement, such as query, operation, search history, and canned query, the information will be transmitted to the Multi-Services Inference Agent (MSIA) the DS in order to let the inference engine to analyze and recommend in advance.

3. **Service Retrieval Agent (SRA)**
In traditional, the semantic web combined UDDI takes a long time to do the hierarchical queries such as find_business(), find_service(), find_binding(), and find_tModel(). Therefore, we design the SRA to separate service information of huge quantity in UDDI to the Web Services Cache (WSC) in Database Server (DS), in order to save the time for accessing various UDDIRs by complex queries while MBS analyze the user’s requirements. SRA which is allowed an accelerated lookup process for finding the best match for users and their requirements is powerful to reduce the UDDI query processes to provide a brilliant performance in the multi-services inference.

### 3.4.2 Model Base System (MBS)

The Model Base System (MBS) includes intelligent deduction engine that uses Data Mining technology to produce the inference. First, the multi-services are established automatically by the system, and the Multi-Services Inference Agent (MSIA) will recommend information to mobile user for relevant services. The MBS provides MSIA, Semantic Inference Module (SIM), Adaptive Airflights Inference Module (AAIM), and other extension modules. The SIM is combined fuzzy logic, inference engine, and OWL-S ontologies to inference QoS of web services value by user’s requirements. And the AAIM uses the QoS-Based Services Selected Method (QBSSSM) to inference the adaptive airflights which are combined various services.

1. **Multi-Services Inference Agent (MSIA)**
Multi-Services Inference Agent (MSIA) receives the user’s requirement from URIA and builds the communication with Semantic Inference Module (SIM), Adaptive Airflights Inference Module (AAIM), and other extension modules for inference Multi-Services. First, MSIA forwards the requirement information to SIM, and SIM will calculate the QoS costs of each relevant web services. Second, MSIA sends those QoS costs and the information of web services to request AAIM or other extension modules. Final, when those modules return the results , MSIA will recommend Multi-Services and invoke these services after user’s submission.

2. **Semantic Inference Module (SIM)**
The Semantic Inference Module (SIM) exploits fuzzy logic and ontology to explain and to represent the data of Web services. There are four steps in SIM:
   a. First, Fuzzy classifier asks for the Web Service Caches (WSC) that were inserted and updated properties of web services in UDDIRs by SRA.
   b. Fuzzy Classifier uses OWL-S to explain the each Web service in WSC.
   c. In inference engine such as OWLJessKB, it defines fuzzy terms and related membership functions that are based on the data schema of web services.
   d. Based on the OWL-S interpretation, fuzzy classifier asks inference engine to calculate the fuzzy value (as QoS cost) of web services for different fuzzy terms.

In this case, we use ontology to explain the meaning of slot name in the databases. Based on airline ticket data, we define three fuzzy terms (such as “cheap”, “medium”, “expensive”) related with ticket fare to classify Web services. Generally, people evaluate ticket fare with three different levels, the cheap fare, or the medium fare, or the expensive fare. Therefore, we use the three degrees for ticket fare as fuzzy terms [4]. The membership functions related with three fuzzy terms mentioned previously are shown in Fig. 5.

We make use of protégé_3_3_beta as the tool for editing ontology. The meaning of each slot name resided in airline database is defined by OWL-S. After building OWL-S document for interpreting the database of airline service, we use the following query in OWLJessKB to tell if the input slot name is the subclass of one class in OWL-S document. For example, based on the OWL-S definition, the input slot name “value” is the subclass of “price”, and price is related with three fuzzy terms, “cheap”, “medium” and “expensive”. Therefore we can obtain the three fuzzy values (as QoS cost) for “cheap”, “medium”, and “expensive” as fuzzy terms to describe Web service. Fig. 6 shows the query with OWL-S. And then QoS cost can be modified to combine different fuzzy terms by other fuzzy operations such as addition, subtraction, multiplication, division, log, and etc.
(3) Adaptive Airflights Inference Module (AAIM)

Adaptive Airflights Inference Module (AAIM) provides QoS-Based Services Selected Method (QBSSM) algorithm to inference adaptable airflights (such as Multi-Services) which are like to solve the Travel Salesman Problem (TSP). In this airline case, there are many airline companies to provide various airflights (such as web services in UDDI) in each airport (such as routing node in TSP), we uses QoS-Based Services Selected Method (QBSSM) of AAIM to inference by QoS costs (such as each cost of arc in TSP) calculated in below and return the results to MSIA.

QBSSM consists of a set cooperating agents called ants that cooperate to find a good solution for optimization problems on graphs similar to the TSP. The QBSSM floods searching ants to all its adjoining and QoS satisfied nodes. Every adjoining node selects out the best QoS cost one due to an early-setted judgmental function from all the arrive ants, then copies and floods it again. The ants go on flooding until it gets to the destination node at last [6, 9]. The QBSSM algorithm is described as follow.

a. Creating ants: Each ant includes ant_id, source_node, destination_node, search_routing, routing_fittness, QoS_cost, and success. The ant_id is identification number of each ant. The search_routing which is the routing from source_node to destination_node inference by routing_fittness. The routing_fittness is calculated by degree of QoS cost which includes price-cost, time-cost, and etc through fuzzy inference. Final, the success will be set when ant gets success routing.

b. Source node behaviors: This node creates many ants in all their individual adjoining and QoS satisfied nodes. And then it waits and stores for the ants which get success routing coming back. We will select the best one of these routings to suggest adaptable airflights.

c. Medial nodes behaviors: If the ant is new, it will come back to source node when the medial node is destination node. And medial node adds node information into the ant and floods it to its adjoining and QoS-satisfied nodes. If the ant is old, it will be dead when its QoS cost is lower than other ants’ which are stored in medial node before. Else its QoS cost is better, the medial node will store it and update node information.

(4) Other Extension Modules

Other extension modules which can be called by MSIA are designed some algorithms into to them such as QBSSM for inference. The different algorithms individually receive the QoS costs of web services from SIM to inference adaptable Multi-Services automatically for different user’s situations.

3.5 Database Server (DS)

The database server includes Web Service Caches (WSC), User Requirement Database (URD), connection module, and control module. The server also offers the integrated web services properties and user requirements to store, and it is a powerful application tool to provide information to SWSS for multi-services inference.

4. Case Study and Evaluation

The airline ticket reservation as one kind of Web services is provided by various airline companies on the internet. MS helps travelers find adaptable airline tickets for their traveling plans. Generally, users want to find airline ticket reservation services (such as a single service) through UDDI or the current matchmaking for web services. In MS, the system will recommend adaptable airflights (such as Multi-Services) to MUs. The proposed method which is shown as Fig. 3 is applied to solve this problem according to the following procedures:

Step 1: Many airline companies will provide their airline services on themselves SOAP site (such as AXIS2) and publish the information of those services which include company name, flight number, department time, department city, arrive time, arrive city, price, and etc. to UDDIRs based on JUDDI.

Step 2: When MUs inquire the SRA for Multi-Services as the adaptable airflights through UIA, they send their requirements as a part of the request.

Step 3–4: The UIA will send the MUs’ requirement to URIA. URIA supported the processes include lexical
analysis, stemming algorithms, indexing, and searching will check and store user’s information in URD for inference user’s requirements.

Step 5~7: The SRA holds up-to-date information on offers currently available for a group of services which have been requested recently. To keep offer lists up-to-date, the SRA inquires the one or more UDDIRs periodically regularly in order to check, find, and get for new offers.

Step 8: The URIA will search and get relative services from SRA and send them to MSIA. When MSIA receives the user’s requirement inference result from URIA, it will control and coordinate various modules in MBS.

Step 9: The SIM will inference user’s affinity information by S-membership function combined fuzzy logic according to user’s requirement from URIA. If user wants to have a cheaper travel from Taipei to Beijing at 2007/10/30 08:00, the SIM will test the available services and increase the weight of price to calculate QoS cost to be used by AAIM. The QoS cost of each services is shown as table 3, table 4, and table 5.

Table 3. The QoS cost of airflights from Taipei to Beijing
(Exchange Rate: 1 TWD = 0.2372 HKD = 0.2298 MCY at 2007/10/21)

<table>
<thead>
<tr>
<th>Company</th>
<th>Flight NO.</th>
<th>Departure time</th>
<th>Departure City</th>
<th>Arrive time</th>
<th>Arrive City</th>
<th>Price (TWD)</th>
<th>QoS cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVA Airway</td>
<td>BR851</td>
<td>10/30 08:15</td>
<td>Taipei</td>
<td>10/30 15:20</td>
<td>Beijing</td>
<td>20522</td>
<td>0.2551</td>
</tr>
<tr>
<td>Cathay Pacific</td>
<td>CX407</td>
<td>10/30 08:30</td>
<td>Taipei</td>
<td>10/30 15:20</td>
<td>Beijing</td>
<td>24150</td>
<td>0.3832</td>
</tr>
<tr>
<td>China Airline</td>
<td>CI641</td>
<td>10/30 08:50</td>
<td>Taipei</td>
<td>10/30 15:20</td>
<td>Beijing</td>
<td>26621</td>
<td>0.4889</td>
</tr>
<tr>
<td>Cathay Pacific</td>
<td>CX467</td>
<td>10/30 08:55</td>
<td>Taipei</td>
<td>10/30 15:20</td>
<td>Beijing</td>
<td>24150</td>
<td>0.3832</td>
</tr>
</tbody>
</table>

Table 4. The QoS cost of airflights from Taipei to HongKong
(Exchange Rate: 1 TWD = 0.2372 HKD = 0.2298 MCY at 2007/10/21)

<table>
<thead>
<tr>
<th>Company</th>
<th>Flight NO.</th>
<th>Departure time</th>
<th>Departure City</th>
<th>Arrive time</th>
<th>Arrive City</th>
<th>Price (TWD)</th>
<th>QoS cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>China Airline</td>
<td>CI 603</td>
<td>10/30 08:15</td>
<td>Taipei</td>
<td>10/30 10:00</td>
<td>HongKong</td>
<td>3820</td>
<td>0.0010</td>
</tr>
<tr>
<td>EVA Airway</td>
<td>BR851</td>
<td>10/30 08:20</td>
<td>Taipei</td>
<td>10/30 10:00</td>
<td>HongKong</td>
<td>8700</td>
<td>0.0081</td>
</tr>
<tr>
<td>Cathay Pacific</td>
<td>CX407</td>
<td>10/30 08:30</td>
<td>Taipei</td>
<td>10/30 10:15</td>
<td>HongKong</td>
<td>4200</td>
<td>0.0015</td>
</tr>
<tr>
<td>China Airline</td>
<td>CI 641</td>
<td>10/30 08:50</td>
<td>Taipei</td>
<td>10/30 10:35</td>
<td>HongKong</td>
<td>3820</td>
<td>0.0013</td>
</tr>
<tr>
<td>Cathay Pacific</td>
<td>CX471</td>
<td>10/30 08:55</td>
<td>Taipei</td>
<td>10/30 10:45</td>
<td>HongKong</td>
<td>4200</td>
<td>0.0018</td>
</tr>
<tr>
<td>EVA Airway</td>
<td>BR865</td>
<td>10/30 09:15</td>
<td>Taipei</td>
<td>10/30 10:55</td>
<td>HongKong</td>
<td>8700</td>
<td>0.0119</td>
</tr>
<tr>
<td>Cathay Pacific</td>
<td>CX403</td>
<td>10/30 09:25</td>
<td>Taipei</td>
<td>10/30 11:20</td>
<td>HongKong</td>
<td>4200</td>
<td>0.0022</td>
</tr>
<tr>
<td>China Airline</td>
<td>CI 605</td>
<td>10/30 10:00</td>
<td>Taipei</td>
<td>10/30 11:45</td>
<td>HongKong</td>
<td>3820</td>
<td>0.0020</td>
</tr>
</tbody>
</table>

Table 5. The QoS cost of airflights from HongKong to Beijing
(Exchange Rate: 1 TWD = 0.2372 HKD = 0.2298 MCY at 2007/10/21)

<table>
<thead>
<tr>
<th>Company</th>
<th>Flight NO.</th>
<th>Departure time</th>
<th>Departure City</th>
<th>Arrive time</th>
<th>Arrive City</th>
<th>Price (TWD)</th>
<th>QoS cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air China</td>
<td>CA108</td>
<td>10/30 10:40</td>
<td>HongKong</td>
<td>10/30 13:55</td>
<td>Beijing</td>
<td>8704</td>
<td>0.0241</td>
</tr>
<tr>
<td>Cathay Pacific</td>
<td>CX6108</td>
<td>10/30 10:40</td>
<td>HongKong</td>
<td>10/30 13:55</td>
<td>Beijing</td>
<td>17119</td>
<td>0.1308</td>
</tr>
<tr>
<td>Cathay Pacific</td>
<td>CX6880</td>
<td>10/30 12:00</td>
<td>HongKong</td>
<td>10/30 15:20</td>
<td>Beijing</td>
<td>17119</td>
<td>0.1621</td>
</tr>
<tr>
<td>Air China</td>
<td>CA102</td>
<td>10/30 12:45</td>
<td>HongKong</td>
<td>10/30 16:00</td>
<td>Beijing</td>
<td>8704</td>
<td>0.0326</td>
</tr>
</tbody>
</table>

Step 10: To search the adaptable airflights (Multi-Services), the AAIM will find the adaptable routing from department city to arrive city by QBSSM according to nodes (such as each airports) and path (such as QoS cost). QBSSM creates many flooding ants from various nodes to search aim node by QoS cost shown as Fig. 7. We can find the adaptable airflight and save eight thousand dollars for MUs by Multi-Services which is better than single service. To compare those results of single service and Multi-Services is shown as Fig. 8 and Fig. 9.

Step 11~12: MS4 returns the result and recommends the adaptable airflights to MUs. If MUs agree this suggestion, MS4 will make those airflights tickets reservation automatically.

Step 13: MUs will pay the money to those airline which are booked airflight tickets and get those tickets and bills.
5. Conclusion

In this research, we proposed a Multi-Services Semantic Search System (MS\textsuperscript{4}), which provides user’s requirements inference and relative services search by semantic inference engine and find the best services composition to recommend Multi-Services. In this airflight case, we discover the result Multi-Services is better than traditional single service when MUs consider price-oriented services first. MUs can save more than eight thousand TWD from Taipei to Beijing. MUs also can conveniently obtain customized Multi-Services and decision to get and use those services according to their requirement in advance by MS\textsuperscript{4}.

Acknowledgments

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References


CRM Implementation Strategy: Aligning the Organization and the Customer

Lyle R. Wetsch, Memorial University of Newfoundland, lwetsch@mun.ca

Abstract

In the majority of Customer Relationship Management (CRM) Implementations customers have been ignored with CRM either being viewed solely as a technology initiative [1] or with organizations focusing only on internal process improvements [2]. While many authors have argued the individual importance of either a technology focus or the importance of the customer relationship, this paper proposes that the appropriate CRM Strategy will vary depending on how the organization is aligned with their customers.

It is proposed that a modified version of the Strategic Alignment Model originally proposed by Henderson & Venkatraman [3] is appropriate for evaluating organizational CRM Strategic Alignment with their customers. By evaluating alignment along two key CRM dimensions, Technological Centricity and Relational Centricity, four strategic quadrants are created. By identifying the organizations current position on the strategic map quadrants and then mapping the location within the quadrants that their customers wish to be engaging the company the degree of CRM Alignment with the customer is identified. If areas of misalignment are identified, then the organization can follow the appropriate strategy to achieve alignment.

Keywords: Strategic Alignment, CRM Customer Alignment

1. Introduction to CRM

The ancestral history of Customer Relationship management (CRM) extends through several disciplines including Marketing [4], Management [5] and Management Information Systems [6]. It is partially because of this diverse background that defining and classifying the term CRM and related research has been very difficult. Early in the new millennium, several researchers focused on isolated elements of CRM. For example, [7] looked at data mining and technological aspects, [8] focused on relationship strategy, and [9] discussed the use of technology to facilitate relationships.

This time frame also represented a period of phenomenal growth in CRM investment by organizations as a response to a recognised shift from a transactional based economy to a relationship based one [10] and more emphasis was placed on organizational strategies that focused on a more customer-centric approach [8]. The CRM field then experienced a roller coaster ride of investment and acceptance followed by hesitation and uncertainty when early failure rates were cited as high as 70% [11]. Despite the challenges that the successful implementation of a Customer Relationship Management strategy presents, investment in CRM strategy and associated technologies has continued because the potential returns are so promising. According to Gartner [12], despite the global economic environment, CRM software investment alone this next year will be up 14% to over $7.8 billion and is expected to grow to $13.3 billion by 2012.

2. CRM Success

One key area that has been identified as critical to CRM success is obtaining the trust and involvement of the customer [13]. In fact Barnes [14] identified it very clearly, “only the customer can define the relationship” and a relationship can only exist if the customer says that there is one. Unfortunately, for the most part, customers have been ignored in the majority of CRM implementations with CRM either being viewed solely as a technology initiative [1] or with organizations focusing only on internal process improvements [2]. While many authors have argued the individual importance of either a technology focus or the importance of the customer relationship, this paper proposes that the appropriate CRM Strategy will vary depending on how the organization is aligned with their customers. Moving to a highly relational and highly technical initiative may be a successful strategy in some instances and a dismal failure in others.
3. Strategic Alignment the Key

The Strategic Alignment Model was originally proposed by Henderson & Venkatraman [3] as a means of evaluating the alignment between the business strategy and the IT strategy of an organization from both internal and external views. It is proposed that a modified version of this Strategic Alignment Model is appropriate for evaluating organizational CRM Strategic Alignment with their customers (Figure 1).

By evaluating alignment along two key CRM dimensions, Technological Centricity and Relational Centricity, four strategic quadrants are created (as seen in Figure 2). The first step an organization needs to take in determining its appropriate CRM Strategy is to identify their current positions on the strategy map.

To evaluate the organization along the Relational Centricity dimension, the use of the 32 item ‘Market Orientation Scale’ [15] is proposed along with segments of Barua et al [16] ‘Measures of e-Business Drivers of Success’ to evaluate the Technological Centricity specific to the customer interactions. This will allow the identification of the quadrants that the organization is capable of offering its services in.

The organization then needs to map the location within the quadrants that their customers wish to be engaging the company within. The key customer segments are classified using the ‘Technology Readiness Scale’ [17] to evaluate the customer’s Technological Centricity and the ‘Relationship Proneness Scale’ [18] to determine their desired Relational Centricity quadrant. Each segment is represented on the map by a circle whose size is representative of the customers relative importance, either financially, or strategically. Figure 2 shows an organization that is well aligned with their customers with respect to their Customer Relationship Management Strategy. Although in the Strategic Alignment map shown has a small customer segment that is outside of the operational quadrants of the organization (shaded quadrants), they are such a small customer segment that they may be a viable customer segment for outsourcing.

4. Misalignment

The majority of organizations will not be so fortunate as to be perfectly aligned with all of their key customer segments, and so one of the four misalignment categories identified below will be identified through the mapping process:

a) **Lack of Technological Centricity**: If customers are higher on the technological centricity scale than the organization, then they have out-invested the organization and will look for an alternative organization whose technological offerings match their technological preferences better.

b) **Too High a Technological Centricity**: Organizations can also fall into the trap of out-investing their customers. This is less of a concern than misalignment #1 as the organization could simply maintain lower
technology channels while customers are educated by the organization on the higher technology channels or they catch up. The only risk is time and money.

c) **Lack of Relational Centricity:** In this instance, customers are wanted to get closer, but the organization is pushing them away. Should this situation occur, customers will eventually seek out an organization that is more aligned with them relationally.

d) **Too High a Relational Centricity:** If customers do not want a relationship – trying to force one upon them will only serve to drive them away in search of a less invasive organization.

5. Conclusions

When embarking on a Customer Relationship Management Strategy, organizations need to remember that the “customer” should be at the forefront of the strategy as well as in the name. In order to maximize the success of the initiative, aligning the organization with your key customer groups begins with knowing where your organization is able to operate and where your customers want you to be. If areas of misalignment are identified, then the organization can follow the appropriate strategy to achieve alignment. As with many strategic initiatives however, becoming aligned with your customers is a journey, not a destination. Their desires will change and your offerings will continue to evolve, necessitating the ongoing evaluation of the strategy with the appropriate adjustments being made.

References


Social Perspectives of Globalizing VoIP Technology

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Abstract
Based on theoretical lenses of fads and fashions and isomorphic pressures, this research in progress proposes social perspectives that help understand the rapid penetration of Voice over Internet Protocol (VoIP) in the global market. Online interviews between sixteen undergraduate students and their interviewees worldwide provided preliminary understanding which revealed that users often developed awareness of VoIP technology because of their social contacts and their purpose for using VoIP was mostly for maintaining social connections. The potential contribution of such social perspectives on VoIP technology in the global market could thus be expected.

Keywords: Voice over Internet Protocol (VoIP), social perspectives, fads and fashions, isomorphic pressure.

1. Introduction
In contrast to traditional telephone service PSTN (Public Switched Telephone Network) which is based on circuit switching technology, emerging Voice over Internet Protocol (VoIP) utilizes packet switching technology that allows the transmission of voice over the Internet. This packet switching protocol, unlike circuit switching technology, would not occupy communication circuits and thus allow multiple transmissions simultaneously. To the end users, it denotes a much more affordable and convenient voice communication over the Internet and in turn captures increasing attention in the marketplace. By the end of 2008, VoIP (or IP telephony) is estimated to increase to 40 percent of consumer phone calls in the US [25]. Vonage, one of the largest VoIP providers, has acquired 600,000 subscribers by 2005 and the overall market in the US is estimated to reach its pinnacle in the timeframe of 2010 to 2014 [6]. While various standards and regulations might present challenges or obstacles [18][26], this cost efficient technology is perceived to increasingly revolutionize the next generation of telephony [25]. Empirical research has also embarked on investigating factors hindering adoption behavior in specific marketplaces [24].

In line with these emerging interests of VoIP in the business world and research community, this research in progress seeks to understand how VoIP technology rapidly penetrated global markets in recent years. Specific research questions include “How do users develop awareness of VoIP” and “To what extent does social contact influence the use of VoIP.” Drawing from social perspectives [1][12], this study argues that the reasoning behind an individual’s choice of a specific VoIP technology is driven more by social purpose than by economics practice. In other words, end users often come to understand their preferred VoIP technology or applications because of their social contacts; and they continuously use the technology also mostly for social connection and networking purpose rather than economic efficiency or productivity. These social perspectives challenge traditional IT (information technology) implementation literature that is strongly dominated by economics perspectives such as productivity [7], efficiency [5], and profitability [15], or by widely cited theoretical models such as technology acceptance model (TAM) [11] and diffusion of innovation [20].

2. Social Perspectives
Two specific social perspectives on which this proposed study is based are fads and fashions [1][4] and isomorphic pressures [12][16][21]. By the notion of fads and fashions [1] Abrahamson argues that technology users often imitate a fashion setter because fashion setters often inspire others to “trust their choices of technologies and to imitate them” (p.596) and thus frequently shape collective adoption behavior [2]. Specifically pertaining to emerging technology, imitating fashion setters might help avoid risk and uncertainty, confirm emergent norms of innovation practice and in turn gain higher recognition in the field. As the number of users increases, such imitating action is often further urged by “bandwagon pressures” [3][23].

While the notion of fads and fashion focuses on imitation and norms, institutional theorists further articulate three isomorphic pressures emerged from social and institutional context that specifically shape collective rationality and action in the field [12]. According to DiMaggio and Powell, those pressures stem from coercive, mimetic and normative forces that an actor faces in the institutional landscape [16][19]. Coercive pressure is a dominant force that
requires actors to comply with certain collective practice or face severe consequences. At the individual or group level, coercive pressure is most likely to emerge when individual actors fear to be left behind [1] or be excluded from a social group [9].

Mimetic pressure, in contrast, is mostly shaped by environmental and technological uncertainty [21]. As emerging technology (e.g. VoIP) rapidly develops, risks associated with technology uncertainty would become inevitable. While facing such uncertainty, actors in a social group would often fear to be different [1] and in turn tend to model after those who have successfully legitimized themselves in the field [8][12]. Such modeling process is often advocated by opinion leaders that influence those who are inexperienced or less knowledgeable in innovation [13][20] and could be considered as a form of interpersonal reproduction that witnesses emerging technology being widely diffused among users [28].

Finally, normative pressure is largely derived from social norms [10] and often caused by the exchange of information among group members [12]. Such information exchange inevitably creates comparison among group members [14][17] and in turn urges them to retain group identity and legitimacy by complying with social norms that are commonly expected in the group [16]. As more members identify themselves with such collective practices, certain bandwagon effects are likely to emerge and further urge remaining members to act similarly [22][27]. In other words, the more widely diffused an innovation, the higher the normative pressure faced [3].

Based on these social perspectives, this ongoing study proposes that individual choices of VoIP technology are largely driven by social contacts and networking purpose instead of economic evaluation. The specific VoIP technology chosen for this research investigation is Skype for its rapidly increasing popularity and universally accessible features. Within the length limitation, this research in progress only reports below some preliminary findings gathered from interview conversations among frequent users of a specific VoIP technology. While the preliminary understanding is consistent with arguments provided by social perspectives, it supports the potential contribution of this proposed study in that such social perspectives could shed new light on how VoIP providers or IT managers might better market their products and manage their customers.

3. Preliminary Understanding

At the current phase, online interviews between sixteen undergraduate students enrolled in an upper level MIS course in the US and Skype users worldwide provided preliminary understanding of VoIP user behaviors. Each student was requested to follow the same guideline and conducted two interviews with Skype users from countries other than the US or other students’ choices. As a result, a majority of Skype users globally indicated that their first contact of the technology was attributed to their social affiliation and the main reason for their continuous usage was for social contact and networking purpose. Below are some of the highlights extracted from interview conversations.

“I learned about Skype from a person that I work with… [I use Skype] to keep in contact with friends and regular customers and also for networking purposes” (male exotic dancer, Brazil)

“Some of my friends used it, and so I started to use it… [I use Skype] because it is easier to communicate” (male college student, Austria)

“My co-employee just tells about it… [I use Skype] so we can communicate faster relating to my job” (female payroll assistant, Philippines)

“I don’t remember [how to come to know about Skype] probably from friends… [I use Skype] for connection with my friends being abroad” (female graduate student, Georgia)

“I heard about it from a friend. . . [I use Skype because] I was told by one of my friend and he told me there is nice people chatting here, and I am looking for a nice girl, I need honest one, and it is too hard to get honest one this time” (male sales director, Lebanon).

4. Discussion and Future Directions

While these online conversations only briefly highlighted certain global Skype users’ technology behaviors, they provided some basic understanding of how users came to know about this particular VoIP technology and why they used it for daily routines. Evidently, the introductory contact with technology, regardless of country of origin, mostly came from social contacts, (e.g. friends or co-workers). In addition to cultural differences, these users also ranged from a variety of educational and occupational backgrounds. It might thus suggest that as VoIP technology penetrates the
global market, individual users, as long as accessibility to the technology is present to them, would tend to take advantage of social networking functionalities provided by the technology. Whether these social networking purposes are for keeping in contact with friends, connecting with friends overseas, or searching for future significant others, the presence of VoIP technology in general and Skype in particular might continuously shape social lives of individual users in the future.

This preliminary understanding well reflects proposed research questions and theoretical foundation. It might thus imply that a deeper understanding of social perspectives on the use of VoIP technology could significantly benefit the business world and the research community. To practitioners, the marketing strategy to globalize VoIP technology might need to consider not just economic efficiency and technology functionality but also social networking approach whose bandwagon effects could lead to a rapid penetration rate. To researchers, emerging understanding of social perspectives could extend the existing mainstream literature that is dominant by economic and technology considerations. The potential contribution of this proposed research is thus expected.

References


A SCADA System for Mobile Industry

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Abstract
Taiwanese mobile telecom industry encounters the difficult of operation and management due to the dispersing of mobile stations and telecom system in different areas. Therefore it is the important policy for mobile industry that how to draft an effective operation method and to drop the cost of management and human resource.
The aim of this research is to study the operation and management cost reduction of the mobile industry through the supervisor control and data acquisition (SCADA) system application during globalization, privatization and liberalization competition.
Results indicated that the SCADA system has been highly willing to mobile industry in the development of power supply quality and to drop the operation and management cost. Also this research aims at measuring the benefit on SCADA system and to provide decision-makers with useful operation and management strategies as reference.

Keywords: SCADA, TPC, CP, TP, MAC, BTS, BS, OMC, GPRS

1. Introduction
1.1 Motivation
Before 1985, the reserved capacity of Taiwan Power Company (TPC) could stably and sufficiently supply the power consumption; our government didn’t lay much emphasis on the development of load management policy. It is therefore that the industries didn’t pay much attention on their own power energy management procedures.
From 1985 to 1995, the rapid growth of economy as well as the prosperity of industry and commerce, which result in the increase of power consumption year by year. Besides the construction of nuclear power station and power transmission and distribution was conflict with the doubts of their safety and environmental pollution from the general public. Therefore the projects for power development were hampered by these difficulties and the power supply of on-peak hours was gradually insufficient. Thus, Taiwan government emphasize on the load management of those industries with large power consumption in this duration. There are therefore many papers and relevant reports related to load management of power energy ready for reference [1][2][3].

Recently, Taiwan government has been putting lots of effort on joining WTO and developing the operation center of Asia Pacific area. With these regards, how to open Taiwanese telecom market to be freely and internationally accessed by other communities is an important issue. However, the government owned companies deliberate our steps for performing on the international stage, since they have been criticized with low operating performance. Therefore, how to promote telecom industry efficiently and efficiently is of major interest for the government and public.
Taiwanese telecom industry encounters the difficult of operation and management due to the dispersing of mobile stations and communication system. Therefore it is the important policy that how to draft an effective management method and to drop the cost of management.
The aim of this paper is to study the operation and management cost reduction of the mobile industry and through the SCADA system application during globalization and liberalization. Yet the system can be proposed functions: prevent faults, eliminating faults fast and dropping the cost of management.
The SCADA system applies in telecom stations and mobile stations in Taiwan, the characteristics of management and operation can be proposed as follows: (1) Macro Mobile Stations (2) Multi-Task and Multi-User (3) Line/ Modem, OA- LAN stability (4) Real time control program (5) System redundant [4].

1.2 Characteristics and Environment of the Telecom Industry
The trends of business globalization in the late twentieth century enhance the centralization among industries and therefore form business conglomerate. In the latest survey of top-fifty business conglomerate by Common-Wealth Magazine, those industries such as consumer electronics, computer, and communication which are also known as 3C industries were all except communication on the survey lists; however, the communication manufacturing industry
which is the most protective industry in Taiwan was excluded from the survey lists. Since the revenue of their products ranked top 10 around the world in 1985, the information of electronic industries have become the benchmarking industries in Taiwan. Besides, the potential markets arising from telecom liberalization have brought the number of information electronic industries into the R&D and manufacture of telecom products. And moreover, the widespread applications of Internet help integrate information and communication technologies. Under the trends of the above development, this research considers the managerial strategies of information electronic industry as the basis of investigating strategies of communication industry [5] [6] [7].

In Taiwan, government policies play an important role in the development of communication manufacturing industry. And those impacts can be summarized as six dimensions there are:

1. The monopoly of telecom service business.
2. Dual roles of Directorate General of Telecom as operator and supervisor.
5. Transmission equipment industry which is regulated by government procurement policies.
6. The first liberalized telephone set industry.

Taiwanese telecom operates under very different conditions from the telecommunications providers in the rest of Asia.

2. A SCADA Management Framework

2.1 The Management Strategy of the SCADA System

In recent years telecom industry has experienced an unprecedented degree of change in management, process technology, customer expectations, supplier attitudes, competitive behavior and many more aspects. Indeed all the evidence suggests that change is now a permanent feature of business environment and that companies which can adapt to this new environment are likely to gain significant competitive advantage. Thus, using the Porter (1980) generic strategies as a simple illustration, a firm operating an unfocused, differentiated strategy might also be capable of operating a focused differentiated strategy, but not for example an unfocused, least cost strategy [11]. Some transitions between strategies will be relatively easy, others will be more difficult. Abell (1979) suggests that strategy space can be represented as comprising a number of dimensions which might be market, product or technology groups. Within each dimension a number of levels will be open to the organization depending on its strategic competences [11] [12].

Competitive advantage is commonly defined as a position attained by a business unit and perceived by its customers when it is compared with its competitors. They may be characterized as lower cost or differentiation [8] [9] [10]. Focus, which selects one or more segments of the company’s advantage and tries to develop competitive advantages, such as A SCADA system. Now SCADA system applies in telecom stations and mobile stations in Taiwan, the management and operation method can be proposed as follows: (1) Centralize management (2) Disperse management (3) Hierarchical management. A SCADA system hierarchical management framework include: Central Processor (CP), Terminal Processor (TP), Monitor and Controller (MAC), Sensors and Transducer, such as: figure 1, 2 and 3.

![Diagram](image)

**Figure 1. The Hierarchical Framework**
2.2 The Equipment of Monitor and Control

Monitor And Controller (MAC) provides the interface of monitor and control in mobile station (see figure 4) [13][14].

(a) AC source - AC current /AC voltage detect.
(b) DC equipment - DC equipment alarm /DC voltage output.
(c) Air condition - Air condition operating status and Temperature.
(d) Control Entrance - Control entrance detect /Alarm detect.
(e) Air condition control - Air condition operation /Fan / On-Off.
(f) DC equipment - DC equipment alarm /DC voltage output.
(g) BTS Remote Reset / High-level data link control (HDLC) Modem Loop-Back Test.
2.3 Dialup Modem Applications in BS Transmission Network

Dialup Modem is application in Basic Station (BS) transmission network (see figure 5). The function include as follows: [13][15][16]

(1) The messages of equipment alarm upload to Base Transceiver Station (BTS) and MAC.
(2) Alarm messages through BTS to operator management center (OMC).
(3) OMC through Alarm message to TP.
(4) TP use Dial-up method to control MAC and BS.
(5) TP use Dial-up method to collect history data period time.
2.4 GPRS Application in BS Transmission Network

General Packet Radio Service (GPRS) is application in Basic Station (BS) transmission network (see figure 2.6). The function include as follows: [13][15][16]

1. The equipment’s alarm upload to BTS and MAC
2. Alarm message through BTS to operator management center (OMC)
3. MAC received alarm message through GPRS to TP
4. TP use GPRS method to control MAC and BS
5. TP use GPRS method to collect history data during period time.

3. The Affecting Factors on Management Effective in SCADA System

3.1 Foreword

The basic function of SCADA in telecom station and mobile station as follows:

1. Alarm Real-Time upload - (a) As alarm take place information OMC immediately (b) System with Real-Time monitor function.
2. Operating condition inquire - (a) Operator can inquire equipment condition any time (b) OMC can monitor and control remote telecom station / mobile station operating condition any time.
3. Auxiliary function - (a) Run basic control instructions (such as remote control) (b) According special demand to run control instructions, such as Reset (c) Remote fault remove and reduce maintenance cost.
4. History Database - (a) equipment and management optimization (b) equipment operating record (c) Faults and alarms statistics analysis.

3.2 The Analysis on Factors of Management SCADA System

After evaluating the above-mentioned information related to the SCADA system. Using Delphi method, the author has taken the items of table 1 to interview experts, workers and managers of telecom industry and recheck it. The content of the scale is based on a three-round Delphi survey of 10 experts. Finally, the author had concluded the effective measures that are divided into four management dimensions. There are equipment, training, personal and maintenance as bellows:
Table 1. The Analysis on Management SCADA System

<table>
<thead>
<tr>
<th>Management Dimensions</th>
<th>Factors</th>
</tr>
</thead>
</table>
| Equipments            | 1. Network stability and Dual route  
                        | 2. Micro computer Base redundant  
                        | 3. The stability of MAC, Sensors and Transducer |
| Training              | 4. Ignore cultivation plan of worker’s skills  
                        | 5. Accumulation of working experiences cannot really cultivate worker’s skills  
                        | 6. Lack of cultivation organization of skill |
| Personal              | 7. Manager’s concept neglect worker’s skill  
                        | 8. Education and training is ignore  
                        | 9. Worker’s concept with effective ideal |
| Maintenance           | 10. Understand software parameter and function  
                        | 11. Operating procedure standardization  
                        | 12. Use software with familiarity  
                        | 13. The speed on alarm of responds and inquire |

3.3 To Draft Management Strategy in SCADA System

This section describes the information collection and system management options for the telecom industry and then the decision of management strategy in SCADA system (see table 2).

Table 2. The Analysis of Management Strategy

<table>
<thead>
<tr>
<th>Problems</th>
<th>Method / Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitor and control system stability</td>
<td>Draft to keep the system stability methods</td>
</tr>
</tbody>
</table>
| Technical personnel education and training in SCADA maintenance | Technical personnel education and training  
                                                                  Training on Training Institute  
                                                                  Training on work |
| Lack of full authority by occupation, coordination and integration | There is a consensus of reducing human costs and attaching importance to worker’s skills |
| Software parameter and function operation                       | Parameter setup by technical and set standard value as reference |
| Management and operating procedure standardization             | Alarm processing procedure standardization and statistics data reports standardization |

4. Measure the Effective on Management and Maintenance Network

4.1 The Analysis of Management and Maintenance Network

The section 3 has several factors analysis of management SCADA system. This paper will study and analyze the rate policy of mobile industry and also this section will discuss the effective on management and maintenance framework in SCADA system (see table 3). The competitive priority of cost is frequently considered either as a cost reduction or operational excellence strategy. The cost reduction or operational excellence strategy implies a systematic improvement of company operations without the accomplishment of radical innovations.
Table 3. The Effective Comparison of Four Framework of Transmission

<table>
<thead>
<tr>
<th>Framework Item</th>
<th>Modem / Line</th>
<th>E1 Time Slot Sharing</th>
<th>BTS Node Input Modem Dial-up</th>
<th>BTS Node Input GPRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network stability</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Modem (quantity)</td>
<td>N*2</td>
<td>N*2</td>
<td>N+1</td>
<td>N+1</td>
</tr>
<tr>
<td>Transmission equipment cost</td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Line/ Network Maintenance cost</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Response time of alarm</td>
<td>About 5 sec</td>
<td>About 5 sec</td>
<td>About 5 sec</td>
<td>About 7 sec</td>
</tr>
<tr>
<td>Speed of inquire and remote control</td>
<td>About 5 sec</td>
<td>About 5 sec</td>
<td>30-60 sec</td>
<td>About 7 sec</td>
</tr>
<tr>
<td>Real-Time monitor capability</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>System development difficulty</td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Overall investment cost</td>
<td>High</td>
<td>High</td>
<td>Medium</td>
<td>High</td>
</tr>
</tbody>
</table>

4.2 Measure the Benefit on Operation and Management in SCADA System

A SCADA system, which would provide telecom industry with guidance on:
1. The suitability of using specific competitive strategies in business environments exhibiting particular environmental characteristics;
2. The competencies required to support specific competitive strategies effectively;
3. The ability of the company to compete effectively in a number of future business environments.

Adam and Swamidass (1989) assert that “the core content of a manufacturing strategy include cost, quality, flexibility, and technology” [17].

- **Costs**

Costs, which means seeking a lower manufacturing cost. The customer expressed willingness in the SCADA system, but the installation of automatic monitor and controller need extra operation cost which therefore reduce the participation willingness from the customer. From the long-term viewpoint, this load management strategy will save electricity cost for the customer. After the explanation, the customer can accept the concept and will proceed to implement this alternative.

With the rapid growth of air conditioner load, the peak loading of customer in summer daytime period increases dramatically and the condition of peak loading in 15-minute leading demand contract becomes more serious. According to the electric price system in TPC, customers are asked to pay extra cost with respect to the portion of basic fee in the case that the peak loading is higher than the demand contract. On the other hand the inappropriate higher demand contract setting can avoid the occurrence of previous stated problem but will results another problem of higher basic electric fee payment. The basic idea of optimal demand contract strategy is to derive a better demand contract such that the annual electric basic cost can be minimized.

- **Quality**

Quality which means implies offering high quality products and services to the customers.
1. Real-time analysis & reporting
2. Providing comprehensive reports
3. Software are easily operated and well documented.
4. Options of network connection to other systems requiring our data are provided.

- **Flexibility**

Flexibility, mainly related to the innovation of products and services, product mix and production volume. A SCADA system need include: operational flexibility, control flexibility, function flexibility and information system flexibility,
etc.
1. Operator can inquire equipment condition any time.
2. Operator can monitor and control remote telecom station / mobile station operating condition any time.
3. For power monitoring, electroplating process, air conditioning equipments, burn-in room monitoring etc;
4. The Windows-based system can be used to monitor equipment performance and productivity, to diagnose system problems, and to assist maintenance personnel in monitoring alarms.

- Technology

The control method of load consumption is another way to reduce electric cost. The load consumption in automatic control can prevent the customer from penalty of exceeding contract capacity. It means when the power consumption climbs up to the climax, this method can get rid of unimportant load or the interruptible electricity equipment.

The rate, which Taiwan Power Company charges to the industrial customer, is the total power consumption in each month, i.e. how much is one kilowatt-hour? In addition, the added rate is defined as “how much is the power consumption climax in one month.” The load control device of power consumption aims to prevent the occurrence of new climax with the hope of reducing the added rate.

Owing to the deviation factor, all electricity equipment doesn’t operate at the same time. Besides the power consumption is in the status of dynamic variation due to the reasons of the boom-and-bust, season or production and sale plan. The customer has to carry out the control management of load consumption, if the purpose of the economical use on the electricity equipment is required. The monthly power consumption can be reviewed at any time to decrease the electricity cost.

5. Conclusions and Suggestions

5.1 Conclusions

1. Results indicated that the SCADA system has been highly willing to mobile and telecom industry in the development of power supply quality and to drop the operation and management cost.
2. It is hoped that the conclusion of this research will be adopted by the mobile industry to implement SCADA system decrease rate expenditure and to reduce human cost.
3. The mobile industry is willing to install the automatic SCADA system, although initial investment need extra cost. Also this research has provided decision-makers and leaders with useful operation and management strategies as reference.

5.2 Suggestions

1. The author suggests that the further research shall focus on the equipment characteristics and the management characteristics of other industry with mass and disperse power equipment. It is also desired that a feasible useful management strategy is developed to assist the other industry customer to reduce operation and management cost and to increase the competitive capability.
2. The final suggestion is that the future research shall focus on the analysis of power consumption characteristics for the various industries with large power consumption.

References

Determining Personal Evolving Topic-needs to Support Information Search Activities

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Abstract

With the growing amount of information in the organizational memories of knowledge-intensive work environments, knowledge workers are suffering increasingly from information overload. Hence, an important aspect of effective knowledge delivery is supporting task-relevant knowledge by considering the characteristics of tasks and the nature of workers’ search behavior in organizations. The pilot research models in the information seeking (IS) research area show that workers’ information seeking activities exhibit common patterns. Based on the observations of previous studies, this work investigates the issues involved in determining the variations in task-relevant topics to support the information search process. Specifically, we provide an overview of the ISP model and theory; propose an evolving topic-needs determination method to examine the variety of a worker’s information needs for topics across task-stages; and identify a worker’s task-needs precisely by interactively mapping his/her information needs to the specific level of topics in the taxonomy. We have conducted an evaluation in a research institute which has implications for assisting workers who search the relevance information while conducting a long-term research project.

Keywords: Evolving topic-needs, Information filtering, Information search process, Information seeking

1. Introduction

For professional projects in knowledge-intensive domains, improving the capability of knowledge retrieval functions to provide relevant information that meets users’ information needs precisely is of the utmost importance. When executing a knowledge-intensive task, a worker requires lots of explicit or tacit knowledge to support the task’s execution [2][7]. In organizations, intellectual content containing valuable explicit knowledge is usually codified in an explicit form to facilitate knowledge retrieval and reuse [2][6]. Generally, a worker uses documents to understand a task and solve a specific problem. When the worker begins a task, he/she may search the organization’s knowledge repository for information that will help solve the problem at hand. The worker’s search behavior results from the fact that there is a gap between his/her knowledge about the task and the perceived requirements of the task. The gap is called the information need and results in information seeking activities [3][11], i.e., a series of information retrieval activities.

Most commercial information retrieval systems rely on a keyword search method as the primary retrieval mechanism. However, knowledge workers are often unable to express their information needs precisely in short query terms [5][8]. In many cases, the worker may only have a general idea about a topic and may be uncertain about the information required for the task at hand. In recent years, several studies have stressed the importance of modeling users’ interests or information needs for a specific work task incrementally in terms of topics, instead of as a set of weighted keywords or meta-data. For example, Sieg et al. (2004)[10] integrated user profiles and concept hierarchies to infer users' information contexts in order to enhance the original queries. In this way, IF systems learn users' current information needs from the relevance feedback and update the model for future information filtering. Thus, most user modelling approaches use profiling techniques to analyze changes in a user’s topics needs in his/her daily work life, instead of considering the user’s specific topics needs for long-term work tasks.

To date, researchers in the field of Information Retrieval (IR) have focused on representations of documents for the retrieval of documents, search strategies, and assessing the relevance of retrieved documents. Comparatively little attention has been paid to users’ information needs and how to support their search activities. If IR was a tool for obtaining information during a problem-solving task, a single search session would not accurately reflect the changes in information needs during the task’s execution. Information Seeking (IS) involves searching for and using information for a task when a person does not have sufficient prior knowledge. Several empirical studies have observed and analyzed workers’ successive searches and connected them to the task complexities, relevance judgments, and situation of the subjects during the IS process [3][4][5][11][12][13][14]. Table1 lists the characteristics of existing research models of the Information Search Process (ISP). We also show the characteristics of our research
model, which is based on classic models, such as Kuhlthau’s model, Vakkari’s task-based performance model, and Wang-Soergel’s document selection and decision model of different problem stages. The Kuhlthau’s search process model (1993) [5] differentiates a task into six stages with their associated characteristics. It describes the information search process from the user’s perceptive as being experienced in six stages of thoughts, feelings, and actions. The objective is to observe how users locate and interpret information to form a perspective on a topic. Kuhlthau’s study (1993) observed students involved in information seeking for a certain period of time, whereas Vakkari’s studies [11] considered a user’s information seeking activities as the execution of a task progressed (e.g. writing a proposal or completing a project). Based on Kuhlthau’s model, Vakkari divided information seeking activities into pre-focus, focus-formulation, and post-focus stages [5][11][12]. Overall, a user’s search activities involve forming a perspective on the topic of interest based on the derived information, and then interpreting and presenting the information in a meaningful personal ontology. Wang & Soergel (1998) [13] and Wang & White (1999)[14] proposed cognitive models of document usage during research projects conducted in 1992 and 1995, respectively. The results show that, during a research project, document usage is a decision-making process in which decisions are made at three points or stages: selecting, reading, and citing. The above studies could contribute to research on the applications of intelligent information retrieval systems, and enhance the use of knowledge retrieval functions to support task execution by professionals.

Following the trends of information seeking (IS) studies in the information retrieval (IR) domain, we now introduce our research model, as shown in Table 1, to design our information seeking and retrieval model. Our goal is to deliver relevant and pertinent information that will facilitate the execution of professional tasks. Therefore, we track changes in the user’s problem stages and variations in topic-needs when performing long-term knowledge-intensive tasks. Based on the observations of previous studies (see Table 1), the research model simultaneously considers the user’s problem stage and the relevant topics in the research domain, which influence the user’s behavior in selecting and using documents while information needs are evolving. In this work, we propose a topic-need variation determination method that captures contextual information derived from a domain ontology across task-stages. Since a user may only have a general idea about topics associated with performing a task, we introduce a multi-level domain topic taxonomy to determine variations in the worker’s topic needs. This structure allows us to observe and record workers' feedback behavior when they use the proposed system (i.e., their search behavior and relevance feedback on knowledge items) and then determine their information needs. A change in task-stages is inferred by analyzing the correlation between the task’s temporal profile and the worker’s consecutive transactions. Evolving topic-needs across problem stages can be identified by indicators of “generality” and “specificity”. Both indicators have different functionalities in different task-stages, which influence the interactive topic-needs identification process. Consequently, the system can achieve effective document supply in the long-term based on the proposed topic-needs variation determination method and interactive topic identification process.

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Table 1. Information Search Process (ISP) Models

Purpose
Research
Collection
Data
Types
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The remainder of the paper is organized as follows. The process of examining evolving topic-needs across stages is proposed in Section 2. In Section 3, we describe the method to identify the workers’ evolving topic-needs interactively. The experiment design and preliminary experiment results are presented in Section 4. Finally, we present our conclusions and indicate the direction of future works in Section 5.


We propose a topic-need variation determination method across task stages. To conceptualize the domain information of an organization, we require a pertinent ontology; hence we configure the task-based information as a multi-level structure. The topic taxonomy is extracted from a set of documents and expressed as a hierarchy of topics and subtopics, and the variation in topics is determined by the indicators of “generality” and “specificity” defined according to the topic taxonomy. We discuss the steps of this process below, and illustrate the overall process of knowledge supply based on topic-needs across task stages in Figure 1.

*Tracking user feedback behaviour patterns:* To gather data about workers’ search behavior, i.e., usage information, we observe and record workers' feedback behavior when they use the proposed system (e.g., search behavior and relevance feedback on knowledge items), and thereby determine their specific information needs.

*Identifying changes in task-stages:* We propose an on-line task stage identifier that determines a worker’s task stage by analyzing his/her access pattern. The task’s temporal profile in each timeframe is the basis for identifying the worker’s task stage. A change in task stages is inferred by analyzing the correlation between the consecutive transactions detailed in the worker’s temporal profile for the task. Further details are given in the Section 3.2.

*Determining variations in topic-needs:* In this work, we use a topic-based information search method to overcome the limitations of keyword search methods. We believe it is easier to express information needs by topic identification rather than by keyword-based queries [8]. Since our objective is to identify variations in a worker’s topic-needs, we determine the level of his/her topic-needs with indicators of “generality” and “specificity” to show how a level influences the process of profile adaptation. Further details are given in the Section 3.3.

*Identifying user’s topics of interest interactively:* We identify a user’s topic-needs precisely by interactively mapping his/her information needs to the specific level of topics in the taxonomy. Initially, the system only shows the portion of the topic taxonomy based on the value of the indicators for the associated topics and the current task stage. The basic algorithm is shown in Table 2, Section 3.4.

![Figure 1. Process of topic-needs determination across task stages](image)
3. Supporting Personal Work-Task Search Activities

3.1 Personal Ontology Formulation

The evolution of a worker’s task-needs can be discovered by examining the variety of topics selected from the topic-based taxonomy. Once the top task-relevant topics with the associated weights (denoted as TRTW$_i$) have been identified, it would be intuitive to formulate a user’s personal topic ontology for a specific transaction. Each worker’s information needs are represented by a topic ontology, $\Psi_u$. Definition 1 defines the personal topic profile of a user $u$. We represent the worker’s information needs in terms of topics in the research domain, instead of using keyword sets. The rationale is that topics provide a more expressive and less abstract means of representing information needs.

**Definition 1:** The topic ontology of a user $u$, denoted by $\Psi_u = \{\langle \text{topic}_j, w_p(\text{topic}_j) \rangle \}$, contains a set of topics (field- or task-level nodes in the taxonomy) with associated degrees of relevance to the target task in a specific time period; $w_p(\text{topic}_j)$ represents the relevance degree of $\text{topic}_j$ to the target task at time $p$, from the aspect of $u$. The associated degree of relevance indicates a similarity measure between a topic and the target task in a specific time period. Let $FS$ denote the set of topics in the field level and $TS$ denote the set of topics in the task level. An ontology threshold value $\delta$ can be defined by a worker to generate his/her personalized ontology for the target task by filtering out irrelevant fields or tasks with relevance degrees below the threshold value. Accordingly, $\Psi_u = \{\langle \text{topic}_j, w_p(\text{topic}_j) \rangle | w_p(\text{topic}_j) \geq \delta \text{ and } \text{topic}_j \in FS \cup TS \}$. The result forms a user’s personalized topic ontology for the target search task. Figure 2 shows a user’s personal topic ontology in a transaction based on Example 1.

![Figure 2. A worker’s topics ontology in a specific transaction](image)

3.2 Identifying changes in task-stages

A task-need pattern can be expressed as a set of topics and associated relevance degrees. The task-need pattern of a session $l$ in transaction $i$, $\text{Patt}_{iTrans}^l$, is expressed as a set of topics with their associated relevance degrees ($\text{topic}_j, rd_j$). Once the task-needs pattern has been derived, the correlation of the user’s task-needs pattern across transactions can be calculated by Pearson’s correlation coefficient. It is reasonable to assume that a worker’s task-needs will not change dramatically during consecutive sessions of the same transaction, but they may change significantly between two different transactions. Thus, we calculate the correlation between the previous transaction, $\text{Trans}_{i-1}$, and the start session of the current transaction, $\text{Trans}_i^1$, as shown in the Equation (1):

$$
corr_x(A,B) = \frac{\sum_{\text{topic set}} (rd_j - \bar{rd}) (rd_j - \bar{rd})}{\sqrt{\sum_{\text{topic set}} (rd_j - \bar{rd})^2 \sum_{\text{topic set}} (rd_j - \bar{rd})^2}}
$$

Let $A$ represent $\text{Patt}_{iTrans-1}$ and $B$ represent $\text{Patt}_{iTrans}^1$; $rd_j$ and $\bar{rd}$ are the relevance degrees of topic $j$ in $\text{Patt}_{iTrans-1}$ and $\text{Patt}_{iTrans}^1$, respectively; and $\bar{rd}$ and $\bar{rd}$ are the average relevance degrees of the topics in $\text{Patt}_{iTrans-1}$ and $\text{Patt}_{iTrans}^1$, respectively. Table 1 shows an example of $\text{Patt}_{iTrans-1}$ and $\text{Patt}_{iTrans}^1$. The rationale behind the proposed correlation analysis method is that some task-relevant topics in the topics taxonomy may have a high degree of relevance to the temporal profile of the previous transaction; however, they may have a low degree of relevance to the temporal profile at the beginning of the current transaction. In addition, because the correlation values are within
the range [-1, 1], it is easy to track the worker’s access pattern based on the correlation value between transactions. Using a correlation analysis method, we took about one year to observe the behavior of workers when they accessed the knowledge repository in the presented task-based workspace. Based on the results of our sample analysis, we were able to identify a user’s task stage[16].

3.3 Evolving Topic-needs across Stages

Next, we analyze the user’s topic-needs within each task stage. An examination process with two indicators is designed to filter and extract the users’ specific topic-needs and update the user’s personal ontology. The examination procedure is a top-down process. First, we check the nodes at the field level to assess the generality of the topic-needs, and then check the nodes at the task level to determine the specificity of the topic-needs. The output of the discovery process expresses a worker’s information needs for specific topics with “generality” and “specificity” indicators. Technically, the two indicators are clues to help the system reformulate the user’s profile. Figure 2 shows an example of a user’s personal ontology with two indicators in a specific transaction. The different functionalities of the indicators in each problem stage influence the result of profile adaptation while providing relevant documents.

**Generality of relevant topics of worker’s task-needs:** The higher the generality value, the greater the user’s interest in the topics of a specific field. We calculate the generality of task-needs topics across sessions within the same transaction. A field-level topic may include one or more task-level topics; therefore, the generality is the ratio of the top task-relevant topics (TRTWs) at the task level to all nodes in a specific field-level topic, as shown in Equation (2).

\[
Gen(f_i)_{\text{field-level}} = \frac{N_{f_i}^{TRT}}{N^{f_i}}
\]  

where \(N_{f_i}^{TRT}\) denotes the number of task-level topics belonging to field \(f_i\) in the proposed topic-based taxonomy; and \(N^{f_i}\) is the number of distinct task-level topics belonging to field \(f_i\) and the TRTWs of transaction \(i\).

**Specificity of relevant topics of worker’s task-needs:** The higher the specificity value of a field or task-level nodes, the greater the worker’s focus on a specific topic node. The specificity of task-needs topics is derived by counting the frequency of the top task-relevant topics across sessions within the same transaction. Equations (3) and (4) show the specificity of topic \(f_i\) at the field level and the specificity of topic \(t_k\) at the task level.

\[
Spec(f_i)_{\text{field-level}} = \frac{\sum_{\text{session } j} B_{i,j}^{f_i}}{S_i}
\]

\[
Spec(t_k)_{\text{task-level}} = \frac{\sum_{\text{session } j} B_{i,j}^{t_k}}{S_i}
\]

where \(S_i\) is the number of sessions within a transaction \(i\). \(B_{i,j}^{f_i} = 1\) if \(f_i\) is a top relevant topic of session \(j\) in transaction \(i\); otherwise 0. Similarly, \(B_{i,j}^{t_k} = 1\) if \(t_k\) is a top relevant topic of session \(j\) in transaction \(i\); otherwise 0. The summation of \(B_{i,j}^{t_k} / B_{i,j}^{f_i}\) counts the number of sessions in which the topic (\(t_k\) or \(f_i\)) is a top relevant topic.

3.4 Identifying Personal Topic-needs Interactively

To interactively map a user’s information needs to the specific level of topics in the topic-based taxonomy; the system presents general or specific topics to users based on the results reported in the previous section. Table 2 shows the procedure for interactively identifying a user’s topic-needs by using stage information. The task-needs analyzer determines the user’s task-needs in terms of topics in the domain topic taxonomy, and represents his/her information needs as a personal topic ontology, \(\mathcal{V}_u\).

The function of the identification procedure is twofold: (1) to support search activities by determining variations in topic-needs and task stages, as shown Steps 1 and 2 in Table 2; and (2) to update the user’s personal ontology, \(\mathcal{V}_u\).
Based on his/her feedback on the topics, as shown in Step 3 of Table 2. The variable, \( I_{\text{Topic}} \) is an array that stores the user’s topics of interest derived from the user feedback on the topics during the interactive topic identification process. If the user is in the task pre-focus stage, the system checks whether he/she has general or specific topic-needs. The system will then display the appropriate part of the topic taxonomy to fulfill the user’s information needs. It will update the user’s \( P_u \), to help the user conduct future searches. The mechanism helps the user expand his/her topic-needs if the information needs are vague (i.e., in the task pre-focus stage), as shown in the Step 1 in Table 2. As the task progresses, the mechanism guides the user to identify specific topic-needs (i.e., Step 2 in Table 2). Figure 3 is an example of a user has specific field level topic-needs, but doesn’t have specific task level topic-needs. The interface can assist the user to identify specific task-level topic needs interactively.

**Table 2. Procedure for updating a user’s topic ontology by interactive topic-needs identification**

<table>
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<th>Output:</th>
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<td>(a) ( \text{Gen}(f) ), ( \text{Spec}(f) ): The user’s personal ontology with “generality” and “specificity” indicators</td>
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<tr>
<td>(b) ( P_u ): The user’s personal ontology in the Transaction</td>
<td>(b) Update the user’s task profile ( S_p ) to retrieve relevant documents</td>
</tr>
<tr>
<td>(c) ( \text{Trans}_{\text{stage}} ): The task-stage of ith transaction</td>
<td></td>
</tr>
<tr>
<td>(d) ( \delta ): The threshold of generality or specificity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Begin</td>
</tr>
<tr>
<td>(1) If ( \text{Trans}_{\text{stage}} ) in “pre-focus stage” then</td>
<td></td>
</tr>
<tr>
<td>(1.1) If ( \text{Spec}(t_i) \geq \delta ) then</td>
<td></td>
</tr>
<tr>
<td>// The user has specific task-needs, but in the pre-focus stage</td>
<td></td>
</tr>
<tr>
<td>(1.1.1) List the topics in the task-level to help the user identify topics of interest, ( I_{\text{Topic}} )</td>
<td></td>
</tr>
<tr>
<td>(1.1.2) Set all topics in the ( I_{\text{Topic}} = \delta )</td>
<td></td>
</tr>
<tr>
<td>(2) Else if ( \text{Trans}_{\text{stage}} ) is not in “pre-focus stage” then</td>
<td></td>
</tr>
<tr>
<td>(2.1) If ( (\text{Gen}(f_i) &gt; 0 \ \text{and} \ \text{Spec}(f_i) &lt; \delta) ) then</td>
<td></td>
</tr>
<tr>
<td>// The user does not have specific field level topic-needs.</td>
<td></td>
</tr>
<tr>
<td>(2.1.1) List the topics in the task-level of fields ( l ) to help the user identify topics of interest, ( I_{\text{Topic}} )</td>
<td></td>
</tr>
<tr>
<td>(2.1.2) Set all topics in the ( I_{\text{Topic}} = \delta )</td>
<td></td>
</tr>
<tr>
<td>(2.2) Else if ( (\text{Gen}(f_i) &gt; 0 \ \text{and} \ \text{Spec}(f_i) \geq \delta) ) then</td>
<td></td>
</tr>
<tr>
<td>// The user has specific field level topic-needs, but not specific task level topic-needs.</td>
<td></td>
</tr>
<tr>
<td>(2.2.1) If there are no topics in field ( l ) with ( \text{Spec}(t_k) \geq \delta ) then</td>
<td></td>
</tr>
<tr>
<td>(2.2.1.1) List the topics in the task-level of fields ( l ) to help the user identify topics of interest, ( I_{\text{Topic}} )</td>
<td></td>
</tr>
<tr>
<td>(2.2.1.2) Set all topics in the ( I_{\text{Topic}} = \delta )</td>
<td></td>
</tr>
<tr>
<td>Else No Action</td>
<td></td>
</tr>
<tr>
<td>(3) Update ( P_u ) and ( S_p )</td>
<td></td>
</tr>
<tr>
<td>End</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 3. Identifying topic-needs interactively**
3.5 Profile Adaptation

The system delivers task-relevant documents based on the results of topic identification, after which the new task profile of the target task, denoted as $S_{p+1}$, is generated by Equation (5). The equation considers the worker’s task stage as well as the “generality” and “specificity” of task-need topics, which influence the relevant part of the equation.

$$S_{p+1} = \alpha S_p + \lambda \bar{R} + (1 - \lambda)\bar{Temp}_{u,p}$$

$$\bar{R} = \sum_{\text{Root } \subseteq \text{Gene. topic}} w_{\text{gene}} \times w_{p+1}(\text{topic}_j) \times \text{topics}_j +$$

$$\sum_{\text{Root } \subseteq \text{Spec. topic}} w_{\text{spec}} \times w_{p+1}(\text{topic}_j) \times \text{topics}_j$$

where $S_p$ denotes the task profile of the target task at time $p$. The relevant feature vector is derived from the task corpora of relevant tasks sets, while the temporal file, $\bar{Temp}_{u,p}$, is generated according to feedback analysis. In addition, $w_{p+1}(\text{topic}_j)$ denotes the associated relevance degree of task $t_k$ or field $f_l$ to the target task. $\text{Gene}(\text{topic}_j)$ and $\text{Spec}(\text{topic}_j)$ are derived from task-needs topic analysis, as mentioned earlier. $\alpha$, and $\lambda$ are tuning constants. The parameter $\alpha$ is the correlation values between transactions, $\text{corr}_u(A,B)$, as shown in the Equation (1). The parameter $\lambda$ is used to adjust the relative importance of relevant topics and the temporal profile. Note that the task-stage influences the relative importance of general and specific topics, $w_{\text{gene}}$ and $w_{\text{spec}}$. For example, in the early stage of a task, we only consider general topics and ignore specific topics; therefore, $w_{\text{gene}}=1$, and $w_{\text{spec}}=0$. As a task progresses, the content of the temporal profile will be more important than the relevant topics.

4. Preliminary Experimental Setup and Results

4.1 Experimental Setup

The experiments evaluated whether examining a knowledge worker’s various information needs for specific topics in each task-stage could help him/her retrieve more relevant information than the traditional incremental learning method based on the relevance feedback algorithm[9][15]. We evaluated four methods: the Linear-0, Linear-0.5, Stage-Topic $(G, S)$ and Interactive-Topic $(G, S)$ methods. The Linear-0 (baseline) method is an incremental learning process that learns a user’s current information needs from feedback about the recommended information (i.e., documents), and updates the user model for future information filtering. It is based on the traditional relevance feedback method in the vector space model [9][15]. The Linear-0.5 method is similar to the traditional incremental learning technique in that it also considers a worker’s feedback on relevant topics, i.e. the parameter $\lambda$ is set to 0.5. The Stage-Topic $(G, S)$ and Interactive-Topic $(G, S)$ methods are our new methods. The Stage-Topic $(G, S)$ method integrates the user’s task stage and degree of topic-needs variation into the incremental learning process to deliver task-relevant knowledge. The Interactive-Topic $(G, S)$ method is based on the presented topic-needs variation determination method and the interactive topic identification process. After the user profile has been generated, the system retrieves relevant documents from the task-oriented knowledge repository based on the descriptions of the user profile.

Data and Participants: Task-relevant codified knowledge consists of documents in an organization’s knowledge repository that have been accessed via the executed task set, i.e., historical tasks. In this work, the tasks were related to writing research papers or conducting research projects, so we selected evaluation subjects who were engaged in a current task. Since performing a task spans a long time period, we chose the subjects according to the task-stage they were in, i.e., the pre-focus, focus formulation, or post-focus task stages. The roles of the subjects were project leader, system analyzer, or technical reporter. The subjects conducted different projects, such as a survey of information technology service management, text analysis for business intelligence, product recommendation, and deployment of a knowledge management system. The system traced and recorded their search behaviors while using the presented system and delivered documents based on their feedback behavior.

Evaluation metrics: We measured the effectiveness of knowledge support in terms of the precision as used in information retrieval research [1]. The precision rate is the percentage of retrieved items (tasks or documents) that are
relevant compared to the total number of retrieved documents.

\[
\text{precision} = \frac{\text{retrieved documents that are relevant}}{\text{total retrieved documents (TopN)}}
\]

Where \( N = 5, 10, 20, \text{ or } 30 \)

4.2 Experimental Results

Observations under Various Levels of Top-N Supply across Stages: Figure 4(a) and 4(b) show the precision rates of the four methods for the pre-focus, and post-focus stages under various top-N documents. Figure 4(a) shows that the Interactive-Topic \((G, S)\) method outperforms the other methods in the pre-focus stage under various numbers of document support, i.e. top-5, 10, 20, or 30. This suggests that the user can get effective support with the aid of the interactive topic identification process in the early stage of a task’s performance, i.e., the user’s topic selection phase. Similarly, in the post-focus stage, the Stage-Topic \((G, S)\) and Interactive-Topic \((G, S)\) methods perform better than the baseline methods, as shown in Figure 4(b). Notably, the Interactive-Topic \((G, S)\) method achieves the best performance in terms of top-5 document support. It is clear that if the personal search factor (i.e., the user’s problem stage) and the context factor (i.e., topic variations) are considered simultaneously, the retrieval results could be improved significantly in the early and late stages of a task’s performance. Therefore, the proposed topic-needs variation determination method is more suitable for learning the worker’s task-needs than the traditional incremental learning technique. In addition, when the worker has specific topic-needs, i.e., the worker in the task post-focus stage, the proposed methods are also effective in helping him/her retrieve task-relevant documents with the aid of topic identification process.

![Figure 4(a) & (b): The average performance values under various levels of top-N Support in the pre-focus stage, and post-focus stag](image-url)
5. Conclusions

Most current user modeling approaches focus on the analysis of changes in a user’s information needs in his/her daily work life, instead of considering the user’s information needs for a specific long-term task. To address this issue, we propose a topic-needs variation determination method based on the refined information seeking and retrieval (IS&R) model. Specifically, the method examines variations in a worker’s information needs for topics across task stages, and supports long-term exploratory searches. In contrast to the traditional incremental learning model, which relies on the implicit feedback algorithm (IRF) to identify relevant or irrelevant documents, the proposed model can track a worker’s evolving topic-needs across task stages. We developed the Stage-Topic (G, S) and Interactive-Topic (G, S) methods to evaluate the effectiveness of the topic-needs variation determination method. The results of experiments show that the two methods, which consider the personal search factor (i.e., the problem stage) and the context factor (i.e., topic-needs) simultaneously, provide better knowledge support than the traditional incremental learning method. In the future, we will conduct an in-depth analysis of the interrelationship of users’ information search behavior patterns, information needs, and different search tasks. The IS&R model will be enhanced by incorporating personal, task, and context factors in order to design a more comprehensive IS&R framework. Furthermore, the cognitive model of document use for a research project at three points or stages, i.e., document selecting, reading, and citing, proposed by Wang & Soergel (1998) and Wang & White (1999) will be incorporated into the IR system design process. Our work could contribute to research on the applications of intelligent information retrieval systems, and enhance the use of knowledge retrieval functions to support project/task execution by professionals.

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The Effects of Blogs on Brand Attitude and Purchase Intention

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Abstract

The popularity of blogs has become a common means of communication among Internet users and has caught the attention of marketers, particularly as a marketing tool [13]. Driven by the need to establish strong relationship with their customers, business have turned to the next generation of marketing approaches, including customer-centric, market orientation, integrated and relationship marketing ([3], [4], [6], [9], [10], [11], [12]). Key to this success, though, is the ability to interactively and effectively communicate with customers (Peppers and Rogers, 1993) to learn of and satisfy their needs [14]. Blogs, web sites that consists of discussion postings from people who are interested in sharing their person experiences or thoughts on site’s topics, allow consumers to share ideas, build community and contact other consumers who are seen as more objective information sources. Blog marketing captures the essence of the blog and emphasizes its features in authentic voice, community power, bidirectional communication and knowledge sharing. This study examines the effects of blogs on brand attitude and purchase intention, and the influence of brand knowledge. It posits that blogs play importantly in building a consumer’s intention to purchase a product or service.

Based on prior studies in blog marketing, this study identifies four salient blog elements: community identification (i.e., belongingness to a group which defines a person in terms of the group, and prescribes and instigates group-oriented behavior), interpersonal trust (i.e., confident belief in the truth of other members of the blog group), two-way communication (i.e., interactive communication before, during and after a transaction between group members and the business), and message exchange (i.e., sharing of information to encourage greater exchange of information).

In this study, brand attitude reflects the cognitive, affective and curative components that influence behavior, such as intent. It helps shape beliefs, judgments and thoughts of an object (cognitive), and conjures emotions, feelings and drives (affective).

Purchase intent gauges a consumer’s plans to buy a brand or product within a time period. Based on the theory of reasoned action [5] and theory of planned behavior [1], it is frequently used as a surrogate measure of actual purchase.

Two components comprise brand knowledge: familiarity (i.e., number of prior experiences with the product) and expertise (i.e., ability to successfully perform product-related tasks) [2].

Figure 1 depicts the research model of this study. It suggests that the blog marketing elements will positively affect a consumer’s attitude toward a brand (i.e., brand attitude) and subsequently brand attitude will positively influence his/her purchase intention. These relationships are further strengthened by his/her knowledge of the brand. The following hypotheses have been developed to test the relationships.

The collective information and knowledge that consumers gain through a blog site will affect the development of their attitude towards the brand. A blog can be used to openly discuss the brand and shape other’s attitudes of it.

H1: Blog marketing elements have a positive effect on brand attitude
   H1a: Community identification has a positive impact on brand attitude
   H1b: Interpersonal trust has a positive impact on brand attitude
   H1c: Message exchange has a positive impact on brand attitude
   H1d: Two-way communication has a positive impact on brand attitude
Based on the Fishbein and Ajzen’s [5] theory of reasoned action, attitude toward an object has a significant impact on the intent on performing an act. Thus, the attitude that an individual has developed toward a brand will play upon his/her intention to purchase it.

H2: *Brand attitude has a positive effect on purchase intention*

Consumer knowledge of a brand will enhance (moderate) the effects of the blog’s elements on his/her attitude towards it. Greater knowledge increases the development of a positive brand attitude.

H3: *Brand knowledge moderates the relationship between the blog marketing elements and brand attitude*
   - H3a: *Brand knowledge moderates the relationship between community identification and brand attitude*
   - H3b: *Brand knowledge moderates the relationship between interpersonal trust and brand attitude*
   - H3c: *Brand knowledge moderates the relationship between message exchange and brand attitude*
   - H3d: *Brand knowledge moderates the relationship between two-way communication and brand attitude*

Brand knowledge enhances (moderates) the relationship between brand attitude and purchase intention. Greater positive experience with a brand will increase brand attitude’s influence on purchase intention.

H4: *Brand knowledge has a moderating effect on the relationship between brand attitude and purchase intention*

Data were collected through an online survey in Taiwan. Items on the survey instrument were adopted from prior studies and measured on 7-point Likert-type scales. Of the 1,033 questionnaires received, 727 were usable, for a return rate of 70.5 percent. A confirmatory factor analysis supports the validity (convergent and discriminant) and reliability (Cronbach’s alpha) of the instrument. A structural equation model and series of regression models tested the direct and moderating effects, respectively.

The results partially support the positive effects of the blog marketing elements on brand attitude (H1). Of the four elements, only community identification is not supported (H1a). Brand attitude was found to have a positive effect on purchase intention (H2). Brand knowledge had a partial moderating effect on the relationship between the blog marketing elements and brand attitude (H3). All elements but two-way communication (H3d) were supported. Lastly, brand knowledge had no moderating effect on the relationship between brand attitude and purchase intention.

Blogs represent an important element that helps marketers build customer-focused relationships in the electronic marketplace. Increasing brand attitude and brand knowledge play importantly to ensure the purchase of a product or service. As demonstrated in this study, interpersonal trust (belief in the truth of other members of the blog group), message exchange (information sharing) and two-way communication (interactive communication) are elements that marketers should focus on to build brand attitude. Furthermore, having prior knowledge and experience with a brand (brand knowledge) enhances the effect of the blog elements on building brand attitude. Thus, investments in creating greater positive brand awareness and exposure will benefit the formation of brand attitude.
Creating a positive brand attitude leads to the greater likelihood of a purchase. In this model, a positive attitude toward a brand appears as a key determinant to a purchase. Hence, marketers should understand that to gain an advantage through blog marketing focus needs to be directed to activities and behaviors that lead to positive images of a brand.

**Keywords:** Blog, blog marketing, brand attitude, brand knowledge, purchase intention

**References**


Who Are Loyal Customers in Online Games?

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Abstract

Recently, online games have become a highly profitable e-commerce application. The market value of online games is increasing significantly and the number of players is also rapidly growing. The potentially high usage and long duration of gamers [2] demonstrate the revenue contribution of gamers to game providers. However, in a recent large-scale panel survey [9], nearly one third of players quitted online gaming in half a year. Research is thus needed to identify who are potentially loyal players and who potentially reduce their online game usage or even quit. Such research enables game providers target the former group and take marketing actions to retain the latter group.

In online activities, flow (optimal experience with total concentration and intrinsic enjoyment) is as a prominent factor [6]. Previous studies have also found that flow experience is a key to strong intentions to play or re-play online games [4]. Flow experiences come from high playing skills and challenges [1]. Thus this study considered flow experiences, skills and challenges. Moreover, online game players reported higher scores on openness, conscientiousness and extraversion than non-players did [8], supporting that game play is associated with these three traits. Thus this study included these traits and linked them to flow experiences and online game play.

This study thus investigates the relationship among personality traits (openness, conscientiousness and extraversion), playing skills, challenges, flow experiences and the intention to play online games continuously. The sample comprised 1852 online game players. Study hypotheses were developed basing on the personality literature, learning, flow experience, and online game play. Measurement items came from those in the relevant literature. Results of four reliability indices, two convergent validity criteria, one discriminant validity criterion, and six measurement model fit indices supported the quality measurement. Structural equation model was used to test hypotheses.

The analytical results indicated that player openness and conscientiousness positively influenced playing skills. Skills and challenges positively influenced flow experiences, which positively influenced the intention to play online games continuously. Moreover, player extraversion directly influenced the intention to play online games continuously. Game providers are thus recommended to target prospective customers who are high in openness, conscientiousness and extraversion. Since students comprise a significant part of players, research findings on student personality can be applied. Students of product design were found creative [7], suggesting that they are high in openness. Natural sciences students were found accurate [3], suggesting that they are high in conscientiousness. Art and social sciences students were found sociable [5], suggesting that they are high in extraversion. Those individuals may be good target customers for game providers. Game providers can also help players improve their gaming skills, and provide some tough challenges in games.

Keywords: online games, personality traits, flow experiences, playing skills, challenges

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Differences, 15, 351-352.


Cargo Security Early Warning System – The Application of Neural Networks to Detect Cargoes with Potential Security Fraud

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Abstract

Every year, more than 5,500 vessels carrying 4.5 million cargo containers pass through the airports and harbors of the U.S. With $200 billion worth of goods flowing in and out of Los Angeles and Long Beach, these ports have a large influence on the economy, across several different industries including aerospace, electrical, consumer products, textiles, among others [1]. Given the importance of the ports and their significant influence on the urban population, it becomes more and more important that some type of real-time monitoring/early warning system is needed to ensure the security and safety of the ports. Ever since the terrorist attacks of September 11, 2001, security has become a national epidemic. Great emphasis has been placed on securing the U.S. borders to help minimize any threat of attack. With that, it has been increasingly recognized that the country’s ports represent a significant point of entry and vulnerability. For example, in 2004, customs inspectors started scanning more than double the percentage of packages compared with 2003 after recognizing the potential threat. Nevertheless, only 5.4 percent of all incoming cargo is scanned for contraband given the enormous cost and time necessary for manual inspection. Even with the advent of gamma, X-ray, and radiation detection technology, manual inspection of all cargo coming from just the ports of Los Angeles and Long Beach alone would not be practical given the processing time and financial implications, and the fact that these two ports represent 30 percent of all U.S. international sea trade. Known that the current security controls in place at the ports are not adequate for today’s environment, an information system solution to support safe movement of cargo would greatly improve safety with a minimum impact on current processes. According to Rod MacDonald, acting assistant commissioner of the U.S. Customs Border Protection’s Office of Information and Technology, collecting and reviewing shipment information before arrival is the best solution to combating illegitimate cargo. Application of an information technology solution that takes into account the variability of the cargo process and container variations would be ideal. Therefore, this research explores the possibility of applying artificial intelligence (AI) and machine learning techniques such as neural networks to the security issue at hand. Information is one of the most valuable assets for any organization, and neural networks can exploit this advantage through in-depth analysis and informed decision-making.

SOM Network is a special type of neural network that can learn from complex, multi-dimensional data and transform them into visually decipherable clusters. The theory of the SOM network is motivated by the observation of the operation of the brain. Various human sensory impressions are neurologically mapped into the brain such that spatial or other relations among stimuli correspond to spatial relations among the neurons organized into a two-dimensional map [2]. The main function of SOM networks is to map the input data from an n-dimensional space to a lower dimensional (usually one or two-dimensional) plot while maintaining the original topological relations. The physical locations of points on the map show the relative similarity between the points in the multi-dimensional space. In other words, the data points that were close in the higher dimensional space should remain close in the reduced lower dimensional map. Therefore, when grouped into clusters, the cargoes that possess similar attributes values will be in the same cluster. Besides providing the cluster membership information, the SOM visual map clearly depicts the actual relationship among the cargoes within and among different risk groups.

The objective of this study is to explore the possibility of applying SOM neural networks as an early warning system to alert port authorities with cargoes of potential security fraud. When fed the appropriate data inputs regarding cargo containers, this system would “learn” the differences between potentially lawful and unlawful cargoes. Unlawful cargo would include forms of contraband such as untaxed cigarettes, infested fruit, counterfeit software, illegal immigrants, narcotics, drugs, “dirty bombs” (i.e., explosives filled with nuclear waste), weapons, and other terrorist devices. X-ray, radiation scanners, and cameras can only go so far as to detect these forms of contraband. A neural networks based early warning system will allow for port personnel to focus their investigation...
efforts on cargoes that are more likely to contain contraband, which helps to improve detection efficiency and safety.

Because this study is a preliminary investigation of the applicability of SOM to cargo security warning system, we first focused on artificially constructed data. Knowledge of the true data generating mechanisms (the correct cluster membership for each observation) is essential for valid comparisons with respect to the accuracy with which SOM recovers the true cluster structures. A total of 150 random observations were generated that contains 5 observed variables, representing the five important factors: 1) port and country of origin, 2) shipping line/forwarder, type, 3) shipper/exporter and consignee, 4) nature of goods on manifest, and 5) nature of paperwork files/filled out, were equally distributed among the three segments (clusters), low, medium, and high risk.

Predictive models based on statistical techniques have been widely adopted and some techniques perform reasonably well in terms of rate of correctness in their predictions. However, all methods require complex and advanced analytical skill to explain and interpret the output from the prediction model. In this study, we introduce the Self-Organizing Map (SOM) Network that can learn from complex, multi-dimensional data and transform them into visually decipherable clusters on an output map. A salient feature of using SOM method over the other approaches is the added visual map. The 2-dimensional plot provides an easy-to-read graphical interface that does not require specialized analytical knowledge to interpret the results. It is a valuable decision support tool that helps the port personnel visualizes the relationships among inputs. Therefore, the port personnel can interactively determine the composition of the clusters using the output map of SOM and incorporate subjective criteria when desired.

Keywords: SOM Kohonen Networks, cargo security, early warning system, clustering analysis

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References

ERP Systems and Managerial Decision Making – A Model for Analysis

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Abstract
Implementing Enterprise Resource Planning (ERP) systems, the most significant IT development in recent times, affects all aspects of organizational life. While the positive impact of ERP systems on operational efficiencies is well established in the literature, the relationship between ERP systems, decision support capability and decision-making processes has been inadequately investigated in the past. This paper hypothesizes a research model for further investigation. Using standardization and integration, the two key characteristics of ERP systems, the influence of ERP-enabled information environment is explained in terms of its impact on the accessibility/availability, quality and quantity of information. The extent of integration and standardization achieved while implementing the ERP system and organizational culture and size are moderating variables that are expected to moderate the influence of ERP-enabled environment on managerial decision making. Extending recent studies, this study postulates a positive influence of ERP-enabled information environment on decision support capability particularly at operational and tactical level. Though improvement in the quality of information, centralization and the consequent increase in visibility and accessibility have influenced the decision support capability of managers, factors such as information overload and inadequate reporting tools in the ERP software appear to be limiting the managerial decision making capability and quality of decision making.

Keywords: ERP systems, decision making, integration, standardization

1. Introduction
Since the early days of data processing, designers of information systems have been striving to satisfy the requirements of both operational and managerial users. Much debate has centered on the ability of integrated information systems, also called as ES (enterprise systems), to satisfy both the operational requirements for managing basic resources and the managerial requirements for planning and control of these activities. In view of the standardization and integration of the processes and the centralization of responsibility in decision-making consequent to the implementation of these enterprise systems (ES), it is necessary to understand the longer-term effects of ERP systems on managerial decision-making. Even though characteristics of ERP systems such as integration and standardization of information and processes have implications for organizational decision support, this is not explicitly recognized as a major reason for implementing ERP systems.

As an ERP implementation team configures the processes and decision models in the organization, several changes could be perceived, including those relating to the roles and responsibilities of the functional or process managers, the decision-making processes in the organization, and the decisions themselves. These changes may result in a perceived as well as a real loss of autonomy and control, and the imposition of additional constraints to the process and decisions. This study, using a case study methodology, investigated the impact of ERP systems on managerial decision-making capability. In particular, it investigated the role of increased availability, visibility and use of information consequent to the implementation of ERP systems on managerial decision making capability. The paper first provides a review of the literature on ERP systems in the context of managerial decision-making and analyses the limited decision support capability of ERP systems. It then briefly explains the methodology employed in the study and follows this with the findings of the study.

2. ERP Systems – Background and Past Research
ERP systems assist management in all aspects of business transactions, from human resources to production, maintenance, purchasing, sales and distribution, and customer service. These packaged software solutions are configurable information systems that integrate information and information-based processes within and across functional areas in an organization [25]. Considering their standardized and automated processes and their transactional focus, they are also described as systems that show users how to process business transactions and offer a management control system to facilitate planning and communication for managers [6]. ERP systems thus provide
solutions to ‘operational’ integration problems as well as meeting the ‘informational’ requirements of managers [48, 33]. They are therefore expected to reduce costs by improving efficiencies through integration, standardization and automation, and to enhance decision-making by providing accurate, real-time, relevant, up-to-date and timely enterprise-wide information [8, 30]. This section reviews the past research on ERP systems in general and analyzes the limited decision support capability of ERP systems.

Early studies on ERP systems predominately focused on issues such as how these systems added organizational value [26, 8, 31, 43]; implementation issues and methodologies [36, 40, 2, 22]; key factors for successful adoption, and potential problems that may arise during ERP implementations such as end user acceptance and participation [27, 24]; software and organizational fit [41]; and measuring ES success [37]. As can be seen, most of the initial research on ES focused predominantly on issues relating to the implementation phase [13]. Even though organizations achieved some operational, managerial or IT infrastructure benefits after implementing ERP systems [44, 39, 9], their impact on decision-making had not yet been adequately analyzed [6, 20]. Given the increasing presence of ERPs in a large number of organizations today, it is important to investigate their impact on organizations and particularly on organizational decision-making in different cultural contexts [20, 21].

Because of their transaction-centric nature, the capability of ERP systems to support managerial decision-making is considered limited [4, 5]. Even though increased transaction processing efficiencies, higher quality information, greater accessibility of information, and greater support for ad hoc reporting were identified as some of the benefits of implementing ERPs [15, 17], very little impact on the business analysis and decision support areas of management accounting was noticed in the past research. In particular, the use of ERP systems appears to have had only a minor effect on the use of newer management accounting practices, such as Activity Based Costing [ABC] systems, Balanced Scorecard [BSC], value-chain analysis, etc., that emphasize sophisticated manipulation of information rather than simply extracting and reporting transactional data [17, 5]. These authors concluded that ERP systems have simply enhanced mass processing of documents, with very limited true decision support capability. A study by Booth and others in Australia also reported that ERP systems perform better in transaction processing and ad hoc decision support than in sophisticated decision support and reporting [4]. Given the complexity of ERP systems and their conceptually different nature from most stand-alone legacy systems, it is not surprising that ERP users take some time to learn how to extract all potential benefits [10, 39].

Reporting tools available in ERP systems were generally considered inadequate for decision-making by many adopters. Though ERP systems have the capability to generate standard reports that can generally meet average decision-making concerns, many firms feel the need for non-standard reports [17]. Recognising this inherent weakness, a majority of large organizations have invested significant effort in redesigning the reporting tools to suit their internal decision-making styles and processes, though this is relatively expensive and difficult, especially when it involves the transfer of information from legacy systems [14]. Adam and Doyle noted that the reporting capabilities of the ERP packages available in the market were not sufficient for organizations despite vendors’ claims that the software includes leading-edge reporting capabilities [1].

In fact, lack of flexibility of reporting tools and excessive time and costs for training staff for amending existing reports and/or developing new reports were some of the reasons cited for the inability of ERP systems to support decision-making [45]. Stanek and others noted that many of the observations made several years ago on the relationship between ERP systems and decision support systems [DSS] remain fundamentally true and are just as relevant today as they were at the time [45]. Reporting is such a unique management need that many ERP software vendors are not able to cater to the differing needs of their customers, even those in the same industry, with standard reporting tools and solutions, despite their efforts over time to produce various upgrades and versions.

It appears that several major ERP software vendors have recognized and acknowledged the weaknesses of their systems in providing decision support. In response to such criticisms, they have started offering extension products such as business intelligence warehousing and business analytics, supply chain management, customer relationship management and product life cycle management that offer decision support capability. Organizations are increasingly ‘bolting-on’ a decision support system from different vendors on top of the existing ERP system and deriving the benefits of increased automation of processes and powerful decision support capability. For example, SAP, even in their ‘mySAP ERP’ all-in-one solution, have incorporated new reporting functionality in the form of ‘Business Analytics’ to their new customers in the mid-market. This new generation of software, developed recently by ERP vendors, is designed to sit on top of the ERP system to provide a more value-adding and strategic information analysis.
capability. These developments explicitly signal that ERP systems by themselves have limited capacities to meet such needs, and software vendors are offering additional tools and solutions to support decision-making capability. As noted by Holsapple & Sena, the increase in such third party offerings and extensions to ERP systems by the major software vendors reflects the weakness of ERP systems in delivering decision support benefits to business organizations [21].

3. Research Model

In an ERP environment, decision making is expected to be more information-based. Even though ERP systems are not designed primarily to provide decision support and intelligent capability like any other decision support system, the information-based environment facilitated by ERP systems are expected to have implications for the quality, quantity, accessibility/availability and visibility of information. Improved access to relevant, accurate and up-to-date information enables managers to make better decisions and may potentially contribute to competitive advantage [11]. In fact, improved decision making was one of the key reasons sited by managers for implementing ERP systems [12].

As noted by Davenport and others, “driven by the desire for accurate, consistent, complete, real-time information, executives are seeking the same type of efficient, transparent and ‘frictionless’ real-time decision making capability that many manufacturers achieved with just-in-time manufacturing,” [11, pp.21]. In a recent survey, 59% of organizations reported decision making as a distinctive capability delivered by ERP implementation [19]. Similarly, accurate, relevant, real-time, current and single-point view of information enabled by the ERP system is expected to improve both the decision making process as well as its quality. Increased volume of information enabled by the ERP systems, may provide managers information that was hitherto scattered in different places and hidden in various independent information silos, and may contribute to improvement in the decision making process. There, however, is a risk of information overload as a result of availability of increased volume of information facilitated by an ERP system and may hamper the quality of decision making. A research model is thus hypothesized and explained below.

![Figure 1: Research Model – ERP systems and managerial decision making](image)

3.1 Characteristics of ES-enviroment

Integration and standardization, the two key characteristics of ERP systems, could be used to explain the benefits of implementing ERP systems in organizations [39, 9]. Integration of business processes and information results in providing management with better information for decision making and can speed up overall flow of information and transactions [32]. Standardization, defining exactly how a process will be executed consistently anywhere in the enterprise or by anybody, delivers efficiency and predictability [10, 32]. Integration in ERP systems context is viewed from three perspectives – vertical integration, horizontal integration and technical integration While the horizontal
integration is a critical determinant for facilitating cooperation and managing interdependencies across business functions [8], vertical integration facilitates enhanced visibility, accessibility, management control and decision support capability [26]. Horizontal integration enables a ‘single version of the truth’ across the organization and ensures end-to-end visibility, accuracy and certainty of the information that will eventually lead to improved decision making and organizational performance [3, 10, 26].

Vertical integration, however, may facilitate better understanding of the processes and information, centralization of management control, and single real-time view of information and thereby may contribute to improvements in managerial decision making [8, 21]. Thus an ERP-enabled environment characterized by integration and standardization, may enhance visibility, availability, quantity and quality of information and thereby lead to improved decision making capability. It is however, important to note the limitations and costs associated with these two characteristics. Inadequate levels of standardization may limit a firm’s ability to access information and use it for decision making even if data is available somewhere in the system. Absence of right, consistent, accurate and relevant information, may limit organization’s ability to make effective decisions as well as the efficiency of decision making processes. Therefore, higher the level of standardization achieved, higher the capability of the firm to take advantage of the ES-enabled environment in decision making. The full benefits of standardization will, however be felt more if the organization is global and if the processes are repetitive and transaction-based processes such as ‘procure-to-pay’ and ‘order-to-cash’. Thus, organizational size and nature also influences the ERP-enabled environment and thereby the managerial decision making.

3.2 Accessibility, Visibility & Availability of information

Integration of information and processes across an enterprise is expected to increase the accessibility and visibility of information to various functional and operating staff and to assist them in their activities. Considering that ERP systems are a mechanism of integration that allows automation of routine and predictable activities and transactions, they are expected to enhance the visibility of information across the organization without the much needed communication and/or interaction. Thus, ERP system facilitates integration of processes and information horizontally across various units and functions, as well as vertical integration between different hierarchical levels in the organization. This horizontal integration of information and business processes, enhances the instantaneous access to the real-time up-to-date information unlike in an disintegrated environment where the information has to flow through formal channels of communication. Similarly, the vertical integration facilitated by the ERP system also enhances the visibility and accessibility of information to the management without asking for information. In an unintegrated environment, information typically be summarized and massaged by the lower levels of management before submitted as an input for tactical and strategic decision making by senior management.

On the technical side, the integration of information systems and databases facilitates enhanced knowledge processing and improves the information processing capability and thereby the reliability and speed of decisions [Holsaple and Sena 2005]. Increased information visibility is expected to encourage managers to base their decisions on real-time information and facts rather than on rumors or subjective opinions and/or summarized information presented by the lower level managers. Since the information in an ERP environment is instantaneously visible to all employees and managers at multiple levels, it gives no scope or time for manipulation of the information or a smoothing of its effects. Thus, it will have a positive influence on the decision making processes as well as on the decision making capability in the organization.

This influence on decision making capability and effectiveness, however, is expected to be moderated by the extent of implementation of ERP systems and/or the extent of integration achieved. Since most of the claimed benefits of ERP systems over legacy systems and best-of-breed systems arise from the integration of information and processes across functional areas, the ability to extract benefits will be reduced if only a limited set of ERP modules are implemented and/or a limited inter-connectivity is allowed between various hierarchical levels. Evidence from the field suggests that the so-called integration is not full and complete even in organizations where full implementation has reportedly taken place [9]. In certain organizations where only two or three modules are implemented, the level of integration, and therefore the extent of the visibility and accessibility of the information across the organization, is limited. If information and process integration is not achieved both in terms of the quality and depth, then all the potential benefits of ERP systems should not be expected, including that of improved managerial decision-making capability and effectiveness. Thus, the improved visibility/availability and accessibility of information enabled by ERP system may positively influence the managerial decision making process and decision making capability of the firm. It,
however, will be constrained by the extent of integration and standardization achieved while implementing ERP system and the organizational culture, a moderating variable in this study.

3.3 Volume of Information

In providing transactional data, ERP systems tend to increase the volume of information available to managers. While this may reduce the responsibility of decision-making at the operating level, it may actually increase the volume of information required to be handled by management. ERP systems, while providing good transactional engines for operational control, tend to increase the volume of information available to managers [6]. This may contribute to information overload as well as an increase in the complexity of managerial decision-making. According to Eppler and Mengis, research on information overload in the realm of management has mainly been undertaken in the areas of accounting, management information systems [MIS], organization science and marketing [12]. The question of how the performance [in terms of adequate decision-making] of an individual varies with the amount of information the individual is exposed to, is an important issue to be investigated. Even though the amount of information one receives influences positively the quality of decisions or reasoning in general, researchers found that this is true only up to a certain point [12]. If further information is provided beyond this point, the performance of the individual will rapidly decline [7]. This is because the information provided beyond this point will no longer be integrated into the decision-making process, resulting in information overload [34]. The burden of a heavy information load will confuse the individual, affect their ability to set priorities, or make prior information harder to recall [12, 34].

By contrast, Eppler and Mengis further contend that a similar way of assessing the information overload phenomenon consists of comparing the individual’s information processing capacity [the quantity of information one can integrate into the decision-making process within a specific time period] with the information processing requirements [i.e. the amount of information one has to integrate in order to complete a task] [12]. The requirements refer to a given amount of information that has to be processed within a certain time period. If the capacity of an individual only allows a smaller amount of information to be processed in the available time slot, then information overload is the consequence. Schick and others also stressed time as the most important factor regarding the information overload problem [34]. Interesting within this discussion is Schroder and others suggests that information load and processing capacity are not independent of one another, but that the first can influence the second, i.e. dealing with a rather high information load increases one’s processing capacity up to a certain point [35]. In addition, feelings of stress, confusion, pressure, anxiety or low motivation that may be potentially caused by the introduction of any new information system/IT enabled innovation, and particularly a complex ERP system, may signal information overload [18].

It is not only the amount of information and the available processing time [i.e. the quantitative dimension], but also the characteristics of information [i.e. the qualitative dimension] that are seen as major overload elements [23]. In addition, some of the qualitative characteristics of information such as novelty, intensity, uncertainty, complexity and ambiguity can either contribute to overload or reduce it [23]. This leads us to examine the quality of information generated by ERP systems. Thus, though information overload is a complex issue influenced by the characteristics of information, processing capability of the individual manager and information processing requirements, the literature suggests that information overload caused by ERP systems beyond a certain point may be counter-productive. While increasing the complexity of the decision-making process, it may actually contribute to selective use of information by managers in order to deal with the uncertainty and complexity of the real world. Therefore increase in the volume of information enabled by the implementation of ERP system may have no positive effect on the managerial decision making capability. It, however, may be moderated by the extent of the implementation characterized by the level of integration and standardization achieved. If the firm has achieved higher level of integration and standardization, then the increased volume of information facilitated by the ERP system may positively influence the decision making process.

3.4 Quality of Information

Quality of information is expected to influence managerial decision processes and their outcomes. ERP systems, while disciplining the basic information transactions for efficiency and standardization across the enterprise, empower all levels of employee on information analysis issues and provide flexibility [42, 38]. In an ES environment, it becomes necessary for everyone in the organization to understand not only the process in which they work, but also their own specific task, along with the impact their work has on other aspects of the business. This involves a culture shift and forces some discipline in the data entry and information management fields. In addition, the integration of information and processes, standardization of the information/data and processes, elimination of data redundancy enabled by the
implementation of ERP systems contributes to consistency and accuracy of the information [44]. This ensures that the same data is used throughout the enterprise for better and consistent planning and control through single view of information across the enterprise. Therefore, the quality of information provided for decision making is better in an ERP enabled environment.

The skills of employees, which vary from one organization to another, however, may not guarantee input of consistent quality data and may affect the quality of information. The integration of the data across various functions will enhance the critical requirement of the data quality and, unlike in independent legacy systems, may not give opportunities for operating personnel to correct those data quality issues immediately [38]. The risk of incorrect data entry is also relatively high in an ERP context as a data element is entered only once. Thus, ERP systems, while reducing the costs of data entry and improving the overall quality of information, may pose a significant control risk for day-to-day management. In addition, the ability of ERP systems to push data gathering activity to the point of its origination may have a further effect on the quality of information. Operating personnel such as loading workers, production operators and maintenance personnel may not be motivated to carry out data entry and may have neither the skills to input the data nor the ability to understand its implications [47]. While some features of ERP systems such as validity rules for data entry, restrictions on type of data, display of possible entries and match code selections could minimize the possibility of errors, its implementation is still considered a challenge [47, 44].

Even if the information in the ERP system is accessible across the organization in a standard format, the information contained within an ERP system may itself be incomplete. ERP system cannot provide all the information necessary for decision support. There is a wealth of information outside the ERP systems environment that is at least as crucial and important for decision-making as that available in the ERP systems [46]. Other sources of information such as published statistics, market data, industry reports/news items, experts’ opinions etc., though typically outside the traditional ERP boundaries, may provide invaluable support for decision-making. Similarly, legacy systems may contain years of historical data that can be crucial in determining the trends and patterns that could offer intelligent decision support [6]. Even though many organizations have implemented ERP systems, some legacy systems have been left in tact for economic and/or managerial reasons and the historical data contained in them could not be fully transferred into the new ERP system for several organizational reasons [38]. Therefore, it is debatable that ERP systems provide all the information necessary for managerial decision support. ERP system may discourage managers to look beyond ERP system for information and thus may limit the decision making quality and capability of the managers.

Therefore, the skills of employees, the data quality and information management discipline of lack of it, incomplete information available from ERP system are characteristics of organizational and managerial culture that are specific to an organization. Therefore, while the improved quality of information enabled by ERP-enabled environment may have a positive influence on the managerial decision making process, it, however, is expected to be limited by the organizational culture, a moderating variable in this study.

3.5 Organizational factors – culture and size

The extent of the influence of ERP-enabled environment on the quality, accessibility, availability and usage is dependent upon other factors such as the extent of standardization and integration achieved consequent to the implementation as well as organizational size and culture. In addition, managerial decision processes depend largely on the individual decision-maker, the organization in which the decision-maker operates, and the quality of information provided. Thus, organizational culture influences managerial decision making processes as well as its capability. In fact, the flow of information (both volume and quality) within organizations instructs, informs and supports decision-making processes and the decision-maker, and can also act as a constraint on both [29]. According to Gendron and others, several researchers in the past have proposed a number of approaches to understanding, assessing and improving information quality [16]. Information quality relates not only to the intrinsic quality of information but also to how the information will be used by stakeholders for various purposes and in different contexts. An improvement in the quality of decision support and the decision-making process is expected with the improved quality and quantity of information and data consistency facilitated by ERP systems.

Even if an ERP system provides information necessary for decision support, its selective use by managers in a organizational context influenced by organizational culture is an issue. Selective use of information in managerial decision-making, irrespective of its availability and accessibility, is a typical managerial trait, particularly under
conditions of uncertainty. Managers use information selectively in order to rationalize their decision processes and prefer to use data and decision-making processes “with which they are comfortable” [28]. Although ERP systems make information available for managerial decision-making, the application of such information is dependent upon individual managerial preferences and conditions. The choice for using the information is, however, limited by the extent of automation in the decision-making process. In implementing an ERP system that results in standardization and integration of information and processes, and by configuring the processes, organizations in a way, are eliminating some routine decisions normally made by process users [6, 38].

ERP systems are integrated mechanisms that would increase information processing capability at both the individual and organizational level by automating routine and predictable tasks. For example, by setting up certain limits to credits, triggers for stock reorders, availability checks and other order conditions in sales order processing, organizations are eliminating the need for managerial approval, thereby reducing operational decision-making to a mechanistic level. Strategic and tactical level decision making, however, is still in the hands of senior management and are dependent upon the consolidated information available in an ERP system.

By deliberately suppressing genuine choices about some matters and treating them mechanistically, ERP systems will reduce the decision making at the operational level. The choices inherent in the configuration of the ERP systems eliminate the choices to be made by users, thereby reducing the responsibility of employees to make certain routine decisions. These conditions configured in the ERP system will improve the efficiency of the processes and ensure consistent execution of the decisions. The danger in such automated decision-making, however, is that it may lead to inattention to the opportunities of improving the process over time. Consequently, managers may learn to accept consequences without questioning them, allowing the decision-making model to mask reality, with assumed uncertainties embedded in the system.

4. Conclusions

ERP systems will continue to be consequential phenomena for years to come and nearly affect all aspects of organizational life throughout their operational lives. Standardization and integration, the key characteristics of ERP systems enabled information environment, facilitates increased quantity and quality of information and improved accessibility and availability of information to managers for decision making. Access to single-view of information across the enterprise that is real-time, accurate and relevant, puts pressure on managers to use that information intelligently and efficiently, and improve their decision making, and, thereby the overall organizational performance. This involves a culture shift for managers in posting, storing, accessing, and using the information and its single-view across organization, and applies pressure for improved performance. The influence of these characteristics on the managerial decision making capability, however, are influenced by the extent of integration and standardization achieved while implementing ERP systems and the organizational factors such a size and culture. It is necessary to study further the interactions of these various complex variables in a range of organizational contexts that occur following the implementation of ES and to explore the differences and common patterns which occur. Such understanding will assist managers in better management of processes as well as outcomes, and lead to full exploitation of the huge investments made on IT-enabled innovations.

References


An E-business Model Facilitating Service Provider Selection in B2C E-commerce

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Abstract

The advent and expansion of the Internet and its applications, among them e-commerce, has provided new opportunities for the emergence of novel e-business models. A portion of these models are in the form of performing a mediatory role to provide some services for customers or businesses, and to facilitate transactions between them. In B2C e-commerce, often, a service consumer may supply his service demand from a range of providers and when he doesn't have any transaction with many of them making an accurate decision becomes challenging. Therefore, he would need to interact with others to acquire relevant information. Current approaches for addressing this issue are generally rating-based and perform poorly. Recently, an experience-based approach has been proposed by Şensoy et al [1]. This paper reviews this approach, analyzes its weaknesses and problems and proposes a new model to eliminate those problems, in which a third party assists the consumers in choosing their desired service providers.

Keywords: Service provider selection, e-business model, third party, B2C e-commerce

1. Introduction

One of the major advantages of using information and communication technology infrastructure for conducting commerce and business is that, it provides the opportunity to establish novel and innovative business models. In literature, various authors from different disciplines have defined and discussed business models [1] [2] [4] [8] [13] [19]. Rappa [13] defines business model as "a method of doing business by which a company can sustain itself -- that is, generate revenue."

Some of the e-business models are the ones in which a third party places itself between a service consumer (SC) and a service provider (SP) and plays an intermediary role to facilitate commercial transactions between the two parties. To exemplify, in the auction broker model, a third party conducts auctions for individuals or merchants who intend to sell their products, services or information [13].

In the B2C e-commerce model, a consumer, having a service demand, must choose between various providers, in order to decide which company will best satisfy his needs / meet his requirements.

Reputation systems are based on the ratings of SCs and are the current dominant SP selection approach [10]. Reputation systems' architecture can be either centralized or distributed [10]. In centralized reputation systems a central authority is responsible for collecting ratings from SCs, aggregating them, and finally, extracting a reputation score for each SP. SCs can then use these scores to aid their decision making [14] [15] [10]. Distributed systems, in contrast, do not feature a central body which collects ratings and shares reputation scores. Instead, ratings are generally stored and exchanged by individual participants in system [10]. Some authors have discussed the idea of applying distributed reputation systems in Peer-to-Peer (P2P) networks, in order to determine the reliability of peers [3] [5] [6].

Other approaches and methods, such as referral systems [21] and FIRE framework [9], are also propounded by researchers. These come under the distributed approach category, where, for service selection, the trust among entities is considered. Trust is essentially an emerging property of a society [20] and results from interactions among entities. The main difficulty, however, in a distributed system, lies in its non-formalized approach to trust-monitoring,"most formalization of trust lack expressiveness and denote trust merely as a rating" [17, p.326].

In rating-based approaches such as reputation systems, the rating which a given service consumer offers to a service provider, is dependant upon a consumer’s own evaluation and satisfaction criteria, and may significantly differ from
one service consumer to another. Therefore, a rating provided by a given SC would have the potential to mislead, or prove unhelpful to another SC with differing satisfaction criteria.

Şensoy et al [17] propose a distributed experience-based approach for SP selection in which SCs do not specify their level of satisfaction from SPs with simple ratings, instead they record their experiences, resulted from their transactions with SPs and use these experiences to express the quality of services provided by SPs, and share them with other SCs. Consequently, each SC can use these experiences to evaluate SPs according to his or her own satisfaction criteria and make a reliable decision in choosing the appropriate service provider.

The remainder of this paper is organized as follows: as our proposed e-business model is based on an experience-based approach, the next section explains this approach with further details; section 3 shall review the difficulties and drawbacks of distributed experience-based method. Section 4 is dedicated to an introduction of our proposed model and shall highlight the ways it overcomes the discussed problems. The paper discusses the value proposition of the proposed model for SCs and SPs but do not include potential revenue and cost models. Section 5 compares our proposed model with distributed model. The final section of the paper represents our conclusions.

2. SP Selection Using Distributed Experience-based Method

To have an idea about the way that a distributed experience-based method works, here we have briefly represented the proposed method in [17].

We consider a situation in which SCs are looking for their desired SPs to supply their service demands. In order to generate a service demand, several service attributes must be in place. Service attributes may include the price of a service, the geographic location of its projected SP, its delivery duration and so on. In order to select the desired SP, SCs may take the three following steps: 1- discovering other SCs having similar service demands, 2- collecting relevant experiences from those SCs, 3- using collected experiences for modeling and evaluating various SPs and choosing the desired one. In continuation we will look at these steps with further details.

2.1 Discovering Other SCs Having Similar Service Demands, Collecting Relevant Experiences and Modelling SPs

In the distributed experience-based architecture, each SC has a software agent with a unique identifier (e.g., IPv6 address). Also, each agent has a list called an acquaintance list (AL) filled with other SCs who have similar service demands with the owner of the list. The features of a service demand are represented by a vector called demand vector (DV). After receiving a service, SC records the features of the provided service in another vector called service vector (SV). The peer SV of a DV has exactly the same fields as DV, but, whereas DV describes the desired service, SV describes the actual service provided by a SP. An experience is defined in equation 1, Where ED refers to the date when the experience has occurred.

\[ E = (DV, SP, ED, SV) \] (1)

To discover other SCs having similar service demands, a SC uses a special packet called peer discovery message (PDM). This packet contains a DV, a vector and a TTL value. \( \Delta \) vector has the same number of fields as DV and its each field represents the maximum acceptable deviation from a corresponding field in DV, therefore, two DVs will be considered similar if \( |DV_i - DV_j| \leq \Delta \). TTL defines the number of hopes which a PDM should be forwarded. This packet distribution scheme resembles a flooding-based P2P protocol [11]. SCs also use Request Discovery Message (RDM) and Request for Acquaintances Message (RAM) for updating their ALs.

Once a SC discovers other SCs with a similar DV, he fills his AL entries with those SCs, and then uses a special packet called Request for Experience Message (REM) to obtain relevant experiences. At that moment the SC uses the collected experiences to model various SPs and choose the one that would best satisfy his needs / meet his requirements. For this purpose, SVs, which represent the quality of services provided by SPs, are used. First, the SC’s agent groups experiences related to each SP and then aggregates each SP’s experiences individually to model the offered services of various SPs. A variety of methods can be used for aggregation and modeling of experiences related to different SPs. A parametric classification technique using Gaussian model and a case-based reasoning approach are propounded in [11]. Some other applicable methods are also discussed in [10].
strategy is the simplest applicable method [17] and, here, we will briefly illustrate it.

2.1.1 Weighted Average Strategy

In this method the aggregation for a given provider P, is computed using the weighted average of SVs related to that SP:

$$A(P) = \sum_i W_i V_{pi}$$ (2)

$$\sum_i W_i = 1$$ (3)

Here, weights imply the relative importance of each SV. Once, the average service given by each SP is computed, $S_{C_1}$ selects the provider with the closest average SV to its DV.

2.2 Simulations

Şensoy et al [17] have conducted some simulations to assess the performance of the distributed experience-based method in comparison with other SP selection methods. Four different SP selection strategies are implemented in the simulations and are compared in numerous experiments. These strategies are including:

- Random SP selection ($SP_{RAND}$): In this strategy a SP is randomly chosen from a set of SPs.
- SP selection using experiences ($SP_{EXP}$): This strategy uses the distributed experience-based method for SP selection.
- SP selection using ratings (from agents chosen randomly) ($SP_{ratings}$): In this strategy before selecting a SP, SC collects ratings from other SCs and use them for decision making. In some rating-based systems, ratings are obtained from SCs who are randomly chosen as a sample from a set of SCs [10]. For its simplicity, It has been the most commonly used method both in research context and in practice [7] [9].
- SP selection using ratings (from agents with similar demand) ($SP_{ratings}$): In this strategy, contrary to $SP_{ratings}$ strategy, ratings are collected from agents who have a similar demand and satisfaction criteria as the SC.

In simulation, whenever a SC decides to receive a service, he will use all of the aforementioned strategies to make four different SP selections. The four strategies are compared based on the satisfaction ratio they provide for SCs. In simulations, SP and SC sizes are set to 10 and 300 respectively. At the beginning, agents lack any experiences. As the time goes by, and the number of experiences increases, agents are expected to model SPs better and make more effective decisions. At each epoch only a small portion of SCs request and receive a service. Table 1 shows the fields of DVs and SVs. Each field represents a dimension in a multidimensional space called service space. Also, each SP has a multidimensional region generated randomly in the service space, called service region, covering all the services produced by that SP. Service space and service region have nine dimensions, which are shown in table 1.

<table>
<thead>
<tr>
<th>Field name</th>
<th>Type</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>ShoppingItem</td>
<td>Integer</td>
<td>1-1000</td>
</tr>
<tr>
<td>Location</td>
<td>Integer</td>
<td>1-100</td>
</tr>
<tr>
<td>DeliveryType</td>
<td>Integer</td>
<td>1-6</td>
</tr>
<tr>
<td>DeliveryDuration</td>
<td>Integer</td>
<td>1-60</td>
</tr>
<tr>
<td>ShipmentCost</td>
<td>Double</td>
<td>0-250</td>
</tr>
<tr>
<td>Price</td>
<td>Double</td>
<td>10-11000</td>
</tr>
<tr>
<td>UnitPrice</td>
<td>Double</td>
<td>1-100</td>
</tr>
<tr>
<td>Quantity</td>
<td>Integer</td>
<td>1-100</td>
</tr>
<tr>
<td>Quality</td>
<td>Integer</td>
<td>1-10</td>
</tr>
</tbody>
</table>

When a SC requests a service by randomly generating a demand region within the service space, the SP first fixes the immutable fields (i.e., ShoppingItem, Quantity and Location), and then randomly generates a service within its region space. A demand region can be represented by a vector referring to center of the region and a $\Delta$ vector referring to the margins of the region. If the provided service for a given service demand stays within the margins of the requested
service, then the SC who has received this service will be satisfied. Each service demand is generated so that at least one SP will provide it in a satisfactory way.

2.2.1 Simulation Results

Figure 1 shows the satisfaction ratio for three SP selection strategies. $SPS_{\text{RAND}}$ and $SPS_{\text{random}}$ strategies have almost the same performance. It reveals that collecting ratings from randomly chosen agents is not efficient and procures almost the same outcome as selecting a SP randomly. Satisfaction ratio for $SPS_{\text{EXP}}$ strategy is about 90%. Unlike the $SPS_{\text{RAND}}$ and $SPS_{\text{random}}$ strategies which have almost the same satisfaction ratio during simulation, satisfaction ratio for $SPS_{\text{EXP}}$ increases as the simulation continues.

![Figure 1. Satisfaction ratio for different strategies](image1.png)

![Figure 2. Satisfaction ratio for different strategies](image2.png)

3. Problems and Weaknesses of Distributed Experience-based Method

In this section we will discuss some difficulties and weaknesses of the distributed experience-based method are discussed.

3.1 Discovering Other SCs With Similar Service Demands Using PDM Packets

As stated before, the distributed experience-based method uses PDM packets to discover other SCs with similar demands. These packets are distributed using a protocol which resembles a flooding-based P2P protocol [11]. This protocol is inefficient from the viewpoint of the heavy traffic that it imposes to the network. Furthermore, it may also
consume a considerable amount of time to discover an appropriate number of SCs with similar demands.

It is evident that the success of the distributed experience-based method depends on the expansion of the society of SCs who use the method for choosing their appropriate SPs. So that, SCs would be able to simply obtain an appropriate number of relevant experiences from other SCs in the society and evaluate SPs, based on those experiences and select their desired SP. On the other hand, the distribution protocol for PDM packets, lacks the scalability and the more the society of SCs grows, the more challenging and problematic discovering other SCs with similar service demands using PDM packets becomes. In our proposed model, interactions among entities are reformed in such a way that, there will not be any necessity for exchanging such a plenty volume of PDM packets for discovering other SCs with similar service demands.

3.2 Establishing, Managing and Updating AL

Each SC constitutes a list called AL for his service demand and adds other SCs with similar service demands to it. A SC's agent uses PDM and RAM messages to add new entries to its AL, RDM messages to update AL's existing entries and REM messages to obtain experiences from AL's entries. Additionally, to stay consistent with the ever-changing environment, it updates its AL periodically.

The aforementioned list and messages are used to enable SCs to collect their required experiences from other SCs. When, experiences are stored and shared by individual SCs in a distributed schema, using such a list is almost inevitable. Using a third party to manage and share experiences centrally, SCs will not need anymore to establish, manage and update such a list for obtaining their required experiences and will be able to obtain them using a simpler and much more efficient procedure as will be discussed latter.

3.3 Dissemination of Invalid Experiences

The distributed experience-based method presumes that all of the shared experiences by SCs are valid and have actually occurred. However, since, there is not any central authority, the accuracy and validity of experiences cannot be guaranteed, and invalid experiences are likely to be disseminated in system. For example a SP with poor performance may generate and disseminate invalid experiences in order to sustain its competitive advantage in market. Invalid experiences result in inaccurate modelling of SPs and consequently a decrease in satisfaction ratio of SCs. This will endanger SCs' trust towards system's accuracy and validity.

In practice, offering a mechanism to guarantee the accuracy and validity of experiences in a distributed schema is so complex and even impossible. However, such a mechanism is simply applicable where a third-party is in place to store and manage experiences centrally.

3.4 Inefficient Collection of Experiences

Another difficulty with the distributed experience-based method is related to its inefficiency in collecting experiences. In this method, a SC’s agent starts to model SPs as soon as it obtains a predefined number of experiences related to a given DV (e.g., after 250 experiences to reach 80% of satisfaction ratio according to the simulation results). However, the appropriate number of experiences for effective modeling is not determinable beforehand, and primarily depends on the number of candidate SPs capable of offering the specified service in DV. The attributes of a service demand, affect the number of candidate SPs. For instance, the "location" field in DV referring to the location of desired SP, may be set to a wide geographical area and therefore significantly increase the number of candidate SPs.

3.4.1 Unbalanced Experience Collecting

Another problem which directly originates from ignoring the SP that an experience belongs to, when a SC's agent is collecting experiences, is the disability of the agent to collect experiences of various SPs in a balanced way. In fact, regardless of the corresponding SP of an experience, The SC's agent collects a predefined number of experiences and then uses them to model and evaluate various SPs. As a result, there may be 100 collected experiences for a given SP; whereas no experiences are collected for another SP and yet for some SPs a few number of experiences, so that they can not be modelled reliably. A hierarchical architecture of third-parties and their interactions, enable our proposed
model to overcome problems related to improper and inefficient collection of experiences.

3.5 Security Related Problems

In the distributed experience-based method, SCs are individually responsible for storing, managing and sharing their experiences. Taking into consideration, that agents interact with each other and exchange their experiences, they are potentially vulnerable to security threats, and SCs' sensitive information are at the risk of unauthorized access. Although, this risk can be minimized by considering and applying security principles in designing and implementing agents; nevertheless, such issues often accompany the distrust of some SCs and may have a preventive effect on their participation in system.

Another security related problem is the likelihood of SCs' privacy violation. Generally, SCs prefer not to reveal information regarding, what services they have received, how much they have spent for it and where they have supplied their services from. Since, in the distributed approach, each SC's agent has a unique identifier (e.g., IPv6 address), and each SC stores and shares his experiences on his own machine, they are potentially at the privacy violation risk (V. Senic’ar et al., 2003), and their identities may be revealed and be linked to their experiences. Privacy risks also may have a preventive effect on SCs' participation in system.

4. The proposed model for service provider selection

Our model, in essence, utilizes the same method for SP selection as the propounded method in the distributed experience-based approach. However, here, a third-party which afterwards we will call it Experience Provider (EP), fulfils an intermediary role in interactions between the set of SCs. Consequently, the transformed pattern of interactions among the set of SCs, will assist in resolving the discussed problems in the previous section, and SCs will be able to share their experiences and utilize other's experiences to choose their appropriate SP in a less expensive and more effective way.

Here, contrary to the distributed approach, a centralized approach is taken, in which EPs are responsible for storing and sharing experiences centrally. Rating-based methods have also utilized both distributed and centralized approaches [10]. SCs, SPs and EPs constitute the essential entities of our model. Interactions among these entities and the role that each one plays, enables EPs to collect, store and share experiences resulted from transactions between the sets of SCs and SPs.

An EP covers a set of SPs and collects and shares their related experiences. SCs won't need to communicate directly with each other for obtaining their required experiences. Instead, they communicate with EP which contains a repository of experiences related to the set of covered SPs.

Section 3.4.1 discussed the problem of unbalanced experience collection for various SPs. When experiences are managed centrally by an EP, they can be categorized according to the domain that they belong to. For example experiences may be categorized to, book, car, cell phone and etc. furthermore, experiences within each category can be organized according to the SP that they belong to. As a result, when a SC requests experiences for a given service demand, in addition to the DV, EP can consider the corresponding SP of each experience, and thus choose a balanced number of experiences for each SP, so that effective modelling of various SPs would be feasible.

The representation of experiences is a vital issue. Şensoy and Yolum [18] argue that experiences require the representational power of ontologies. And, considering the fact that experiences fall into different domains, they propose two classes of ontologies, namely, the base level ontology for domain independent concepts and the domain ontology for domain dependent ones. The base level ontology covers domain-independent infrastructure of the experience ontology. And, the domain level ontology captures domain specific properties and concepts.

Whenever a SC needs a service and wants to obtain related experiences, he sends his service demand in the form of a DV along with a Δ vector as the similarity metric to the EP. EP uses the Δ vector to compare the received DV with the existing DVs in its experience repository and accordingly marks the qualified SPs. EP, then chooses a balanced number of experiences for each qualified SP to be used in modelling and evaluation phase.

As the time goes by, increased participation of SCs would possibly result in accumulation and storage of a huge
volume of experiences in the EPs' repository. Consequently, the number of qualified experiences related to a particular DV and SP may excess from the appropriate number required for effective modelling of that SP. In such condition, naturally, EP should select a subset of experiences for the SP. Selecting more recent experiences, those having DVs with higher similarity degrees and experiences that have been less frequently selected in the past, with a higher probability are some good ideas for selecting a subset of experiences.

By utilizing the proposed model, SCs will not need anymore to use the costly and inefficient PDM packet distribution method to discover other SCs with similar service demands. Instead, they will simply send their DVs to the EP and obtain their relevant experiences. Therefore, one of the major problems of the distributed approach regarding the inefficient and time-consuming procedure of discovering other SCs having similar service demands will be solved and SCs will be able to obtain their required experiences using a much simpler and more efficient procedure.

Once, for a given DV, relevant experiences are chosen by an EP; SPs should be modelled and evaluated based on those experiences. For this purpose, two different alternatives are conceivable, as the first alternative, EP, itself, can use the chosen experiences to model SPs and just notify the SC regarding the SP that would best meet his service demand. The second alternative for EP is to send relevant experiences to the SC and give over the modelling task to the SC, himself.

The problem of invalid experiences, discussed in section 3.3, directly originates from the absence of a central authority to supervise the entrance of experiences by SCs into the system. Since, in the proposed model, EP plays an intermediary role, it can utilize simple mechanisms as the central authority to supervise the dissemination of experiences and guarantee their validity. For example, SPs can assign some sort of credit to the SCs who have transactions with them, so that while SCs are sending their experiences to the EP they are required to provide the credit to prove the validity of their experiences. As a result, upon the receiving of an experience, EP can simply communicate with the relevant SP to examine the validity of experience and in the positive verification case, store the experience in the repository and share it for the use of other SCs.

In the proposed model, principal functions are performed by the EP and a SC's agent just performs a few simple functions. In fact, in order to obtain relevant experiences, the SC's agent just needs to send DV to the EP. Here, contrary to the distributed approach, establishing, managing and updating of acquaintance lists (ALs) is unnecessary. If, in response to a SC's DV, EP choose not to send back the relevant experiences, and instead, perform the modelling phase itself and just send back the ultimate result regarding the SP that would best provide the requested service, then, we will not even need a SC's agent at all. In such conditions, SCs can send their DVs through a web-based interface provided by the EP and also receive the result through the same interface. Therefore, by utilizing an EP to store and share experiences, the required procedure for collecting experiences and modelling SPs can be performed with simpler steps and more performance. This procedure is illustrated in Figure 3 and goes as follows: 1) Sc sends his DV to the EP. 2) EP searches its experience repository and sends back relevant experiences/modelling result. 3) SC fulfils a transaction with the proposed SP. 4) once the requested service is delivered by the SP; SC evaluates the offered service and disseminates the corresponding experience to the EP. 5) EP communicates with the corresponding SP to verify validity of the disseminated experience. 6) In the positive verification case, EP stores and shares the experience.

Since here, SCs do not store and share their experiences individually, and this responsibility is ceded to the EP, they are not any more at the risk of unauthorized access to their sensitive information as a result of potential security vulnerabilities in their software agents and permitting others to access their stored experiences. Establishing a secure and confident channel between SCs and the EP for exchanging experiences and also providing a safe environment for storing experiences is achievable through exercising current and developing security mechanisms and technologies.

Additionally, by adopting appropriate policies and exercising existing mechanisms, an EP can enhance SCs' trust
regarding their privacy protection and anonymity [12]. By eliminating security risks, SCs would have more motivation to take part in system and share their experiences with other SCs.

Since in B2C e-commerce, SCs often tend to supply their service demands in the shortest possible time and by spending the least transportation cost; generally, local and regional SPs are preferred. Therefore, in order to maximize the effectiveness of provided service, an EP chooses to cover the experiences related to a set of regional SPs. Supposing that this region is a province, then, the EP will store and share experiences that are related to the SPs that are located in that province.

Therefore, a SC who intends to supply his service demand from a regional SP can simply communicate with the corresponding EP covering that region’s experiences, send his DV, collect relevant experiences and evaluate various SPs of the region in order to choose the most appropriate one.

However, such structure can prove useful, provided that a SC needs to choose a SP among the set of regional SPs. In such a structure, a SC who intends to supply his service demand from a wider region, such as a country, supposing that different country’s regions are covered by different EPs, has to separately communicate with each EP, send his DV, receive the result and finally compare different SPs, proposed by different EPs to specify the most appropriate one. This procedure is clearly inefficient and time-consuming.

To solve this problem and enabling scalability, we propose a hierarchical model and some sort of collaborative commerce in which different EPs that have covered different regions, collaborate with each other to fulfil scalability and enhance system’s usability. The number of hierarchy levels can be varied and principally depends on the extent of the region covered by each EP. To comprehend the concept of a hierarchical model, consider a given country including several provinces that each province is covered by an individual EP. To enable SCs to model and evaluate SPs on the country scale, we need an EP in a higher level linking different EPs that each one covers a province; we call this EP a Root Experience Provider (REP). The REP doesn’t itself store any region’s experiences; nevertheless, it establishes connections with EPs covering different regions and realizes the scalability.

When a SC intends to supply his service demand from a set of SPs on the country scale, the following scenario goes on: 1) SC sends his DV to REP. 2) REP, in turn, sends the DV to all of its linked EP. 3) Upon receiving DV, each EP separately models regional SPs using its experience repository and sends back the result to the REP. 4) By receiving results from different EPs, REP compares them and notify the SC about the ultimate result regarding the SP that would best provide the requested service.

By expanding this hierarchy, modeling and evaluation of SPs from wider regions will be also possible. Figure 4 illustrates the hierarchical model.

![Figure 4. The hierarchical model](image)

### 5. Comparison of Distributed and Centralized Approaches

Table 2 summarizes a qualitative comparison of distributed and centralized approaches according to some of the most vital criteria. As distributed and centralized experience-based approaches utilize an objective method for SP selection, they procure a significantly better satisfaction ratio in comparison with today's common rating-based approaches. However, experience-based approach can prove effective, provided that, a balanced number of experiences is already available for each potential SP.
Table 2. Comparison of distributed and centralized approaches

<table>
<thead>
<tr>
<th></th>
<th>Distributed experience-based</th>
<th>Centralized experience-based</th>
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</thead>
<tbody>
<tr>
<td>Satisfaction Ratio</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Implementation</td>
<td>Complex</td>
<td>Simple</td>
</tr>
<tr>
<td>Scalability</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>SCs' Trust</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>

Implementation of the distributed approach involves providing practical solutions for addressing the following intricate issues: 1) in order to enhance system's reliability, agents' past behavior should be considered in interactions; therefore, it should be impossible or difficult for an agent to erase its relation with its past behavior. 2) a distributed communication protocol for obtaining experiences from other agents in the community. Considering these issues, an effective implementation of the distributed approach is a complex practice. In contrary, since, in central approach a central authority (EP) is responsible for storing and sharing experiences centrally, the implementation is much simpler. Section 3.4 discussed the lack of scalability problem in the distributed approach. In fact, because of the costly an inefficient procedure used for SP selection in this approach, it loses its feasibility when there are a large number of qualified SPs related to a given DV. However, the centralized approach realizes the scalability by utilizing the proposed hierarchical structure.

As previously discussed in section 2.1, by using the distributed approach for SP selection, SCs would need to follow a costly an inefficient procedure. By establishing an infrastructure, where a third party is in place to manage and share experiences centrally, SCs would be able to choose their desired SPs using a simpler and much more efficient procedure.

Invalidity of shared experiences, as well as security and privacy violation risks, often accompany the distrust of some SCs. This, consequently results in the reduced rate of participation of SCs in the system. As previously discussed, in a distributed approach, addressing the aforementioned issues is too intricate. On the other hand, the existence of a central responsible authority (EP) significantly facilitates addressing these issues.

6. Conclusion

Since, in rating-based systems, each SC rates SPs according to his or her own satisfaction criteria, collecting ratings form other SCs and using them for decision making is not efficient and procures a low satisfaction ratio. In experience-based method, SCs record their experiences with SPs and share them with other SCs, here contrary to the rating-based methods; SCs do not include any interpretation regarding the received services and corresponding SP. Therefore, SCs can use experiences to evaluate SPs according to their own satisfaction criteria.

In practice, utilizing experience-based method with distributed approach is confronted with some considerable problems. However, taking a centralized approach and utilizing the intermediary role of EPs can provide the appropriate infrastructure to enable SCs to choose their desired SPs in an efficient and effective way. An innate side effect of deploying EP infrastructure is that it stimulates a motivation for SPs to have good behavior and consequently we can expect an improvement in the market quality.

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Drivers of Sports Web Consumption
An Exploratory Study in Korea

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Abstract

In the past sports marketers relied heavily on traditional media channel to promote and to communicate with their fans and customers. Ticket sales and sponsorship had been two most important sources of realizing economic value of sports marketing. In marketing of sports, the popularity of sports/teams/athletes is important elements of promotion designed to increase spectatorship, media exposure, sponsorship, etc. The economic value of the sports/teams/athletes is enhanced as popularity increase. Therefore, the sports marketing involves all possible avenues that can bring additional value for the sports marketers including repeat/up/cross sell of related products/services. Thanks to the growing need for effective customer relationship management (CRM), coupled with the advances in technology both in functionality and in popularity, many marketers appreciate the unique capabilities that Internet marketing offers in pursuing target marketing and CRM initiatives. In addition the Internet offers the advantage of global access to highly involved customers.

The purposes of the paper are to facilitate accurate value-added marketing of various sports using the internet and to present a study that called for information based web marketing management. The study revealed that consumers come to and join in different sports web community through different path, for different reasons, and with different intent. The values of the study are twofold: first, it shows an example of a web based consumer behavior analysis across multiple alternatives (e.g., sports); and second, it offers valuable insights to the practice of sports marketing utilizing the Internet, the new medium.

The study was designed to understand and compare web consumer behaviors across various sports. Specifically, the study instrument was designed to measure the motivation, preferences, purchases, concerns, and satisfaction of various sports web community members in Korea. A number of sports web site with 5000 or more registered members were chosen for the on-line survey. A simple Correspondence Analysis was utilized to calculate multidimensional distances of web-related behaviors of various sports. The analysis produced a perceptual map as well as numerical values indicating perceptual distances of variables under investigation. According to the analysis, web community consumers varied in their primary motivation for joining different types of sports web communities (e.g., group versus individual sports). They also showed variations in preferences and behaviors (e.g., information needs and commerce activities). In general, team sports community members decided to join by referral or group pressure, wanted information on the popular athlete(s), and desired off-site group activities with other members (e.g., soccer fan club party). In case of individual sports such as in-line skating or skiing, members were interested in related product information and showed strong intention for commerce activities on the web. In all cases, members showed highest concern about on-line etiquette such as use of appropriate expressions in web community members’ communication.

It is believed that given the global nature of the medium (Internet), the interest (sports), and the existence of global forum and broadcasting exposure (Olympics), sports web channel may be an important avenue for global marketing of sports and related interests. While the specific details in results may be culture specific, the general thrust and the process of the study may be applicable to studies attempting to establish similarities of customers across various cultures.
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