

On the Potential of Socioeconomic Characteristics to Understand the Adoption of Information Technology

(Work in Progress)

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ABSTRACT

We suggest to use publicly available large-scale socioeconomic data to examine the utility of demographic and social characteristics as proxies for constructs of technology adoption models. Such characteristics can be sourced from socioeconomic surveys in several countries. We suggest a model associating constructs of a technology adoption model with proxies available in socioeconomic surveys. It is discussed that managers and policymakers assessing scenarios for new technology introductions may be given easier to handle indicators in form of demographic and social characteristics to understand important drivers of technology acceptance.

Keywords: Technology adoption, socioeconomic surveys, publicly available data

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INTRODUCTION

The developments of consumer information and communication technologies (ICT) have created a multibillion dollar industry that enables consumers to use a diverse set of ICT such as smart mobile devices, mobile apps and services (e.g., cloud storage). ICT advancement and the growth of affiliated industries have been accompanied by research targeted at understanding how individuals accept and adopt ICT.

Existing research models and empirical analyses on technology adoption research generally use research instruments which demand significant resources to gather data because of their complexity (e.g., Davis 1989, Davis *et al.* 1989, Elie-Dit-Cosaque *et al.* 2011, Neufeld *et al.* 2007, Venkatesh *et al.* 2003, Venkatesh *et al.* 2012). This complexity is necessary to further our knowledge in the area of technology adoption. Yet, for practical application complex instruments may be suboptimal. A manager who needs to select employees to use new systems may not have the time or expertise to run elaborate questionnaires in order to best match employees with technology.

This study investigates the potential of socioeconomic information to draw inferences about technology adoption. Our investigation does not suggest that socioeconomic factors can replace technology adoption models (TAMs) that are based on precise measures and have facilitated an in-depth understanding of human behaviour. Socioeconomic factors can, however, provide an additional view on associations regarding technology adoption that could help practitioners. An example of the use of such data to further our understanding in the context of financial risk-willingness constitutes Schneider, Fehrenbacher & Weber (2017).

In this paper, we use Venkatesh *et al.*'s (2012) technology adoption model (unified theory of acceptance and use of new technology model; UTAUT2) as the underlying theoretical lens. The UTAUT2 can be used to determine consumer's technology adoption in a wider social context. We suggest that several demographic and social characteristics can be used as proxies for the UTAUT2 constructs. Consequently, managers assessing scenarios for new ICT introductions may be given "easier to handle" indicators to understand the drivers of ICT acceptance. This may assist managers in proactively designing interventions (e.g., employee training and marketing) targeted at populations of users or consumers that may be less likely to adopt and use new systems.

In order to identify ICT-use related questions in socioeconomic panels, twelve panels from the LWS Database (Luxembourg Wealth Study Database 2015) are reviewed. Importantly, some of the reviewed panels provide explicit opportunities for researchers to add questions to an upcoming panel wave. The data on online banking in Italy and Austria constitutes the most comprehensive collection in our review and should be used in future research to test our model's predictions.

This paper is structured as follows. First, a brief overview of technology adoption models is given and the UTAUT2 is introduced. Subsequently, some background on socioeconomic panels is provided. Then, potential demographic and social characteristics for approximating the latent constructs of UTAUT2 are discussed and the UTAUT2 proxy model is presented. Finally, the study is concluded and future research avenues are suggested.

BACKGROUND ON TECHNOLOGY ADOPTION MODELS

The technology acceptance model (TAM) (Davis 1989, Davis *et al.* 1989), one of the most widely employed models of IT usage (Venkatesh 2003), is derived from the theory of reasoned action (TRA) and theory of planned behaviour (TPB) (Ajzen 1991, Fishbein & Ajzen 1975). TAM measures perceived usefulness and perceived ease of use as predictors of a user's intent to use IT, and their actual usage on the job. The model focuses on organizational users and has received considerable empirical support. It has undergone a variety of adaptations and extensions.

They can be broadly classified into two types: new *constructs* (endogenous or exogenous predictors) and new *contexts*.

First, a variety of new *constructs* have been proposed to explain technology adoption. The focus has been in testing endogenous constructs. For instance, Venkatesh *et al.* (2003) introduce and empirically test performance expectancy, effort expectancy, social influence and facilitating conditions as main predictors and gender, age, experience and voluntariness of use as moderating predictors for *users' intent* to use IT and for their *actual usage* on the job. Taylor and Todd (1995) show that the endogenous variable perceived behavioural control is a determinant of technology usage. Elie-Dit-Cosaque *et al.* (2011) focus on the perceived behavioural control variable and describe internal forces (computer anxiety and personal innovativeness with IT), external forces (managerial support, quantitative overload, qualitative overload and managerial support) as well as several individual differences (age, gender, education, ICT experience and work status) as determinants of perceived behavioural control. Neufeld *et al.* (2007) demonstrated the influence of the exogenous variable 'project champion charisma' on technology adoption.

Second, technology acceptance has been investigated in various organizational and non-organizational *contexts*. The TAM or extended TAM models have been put into new contexts, such as new user populations (e.g., physicians: Yi *et al.* 2006), new technologies (e.g., e-commerce perspective: Grandon *et al.* 2011; corporate web services: Kim & Olfman 2011; online games: Zhu *et al.* 2012), or new cultural settings (e.g., Sub-Saharan Africa: Musa *et al.* 2005; India: Gupta *et al.* 2008; Thailand: Lertwongsatien & Wongpinunwatana 2003).

These constructs and context extensions have been valuable in enhancing our understanding of ICT adoption. However, there have been limited and inconclusive findings on the influences of individual differences in technology adoption. One reason may be that in TAMs, individual differences are subsumed along with situational constraints and managerial interventions into external and control variables and are not further discussed. Venkatesh *et al.* (2003) were one of the first to draw their attention to individual differences (gender, age, experience) by modelling them as moderating variables. Venkatesh *et al.* (2003) find influences of age, gender and experience on usage behaviour in organizational contexts of several industries (entertainment, telecommunication, banking and public administration). In contrast, Gupta *et al.* (2008) do not find an influence of gender on the adoption of technology in eGovernment.

If one were able to establish individual differences as apparent predictors for behavioural intention and system usage, managers controlling their employees within organizations or targeting consumer markets could be given more straightforward guidelines. In this paper, we use Venkatesh *et al.*'s (2012) *unified theory of acceptance and use of new technology model for consumers* (UTAUT2) as the underlying model because it examines technology adoption in a wider social context. UTAUT2 is based on the unified theory of acceptance and use of new technology (UTAUT) (Venkatesh *et al.* 2003).

BACKGROUND ON SOCIOECONOMIC PANELS

The data reviewed is from the *Luxembourg Wealth Study Database (LWS)*, which provides harmonised socioeconomic data from twelve countries. At the time of review twelve countries were included in the database: Austria, Canada, Cyprus, Finland, Germany, Italy, Japan, Luxemburg, Norway, Sweden, UK and the USA. From the socioeconomic surveys of the twelve countries (see Table 1), two surveys – the Italian and Austrian surveys – have administered questions on the use of ICT. Both surveys ask questions regarding the use of online banking.

The Italian data originates from the Survey of Household Income and Wealth (SHIW) administered by the Bank of Italy. The data was collected in the subsequent years of the reference period, i.e. for 2002 between February and July 2003, and for 2004 between February and July 2005. It is a cross-sectional and partly longitudinal interview survey. By means of a structured questionnaire, the interviewers asked questions and assessed answers. The focus of the survey is to provide information on household microeconomic behaviour within Italy. Information includes demographic characteristics, income, wealth and expenditure. In 2002 and 2004, approximately 8,000 households were sampled with a two-stage stratified sampling, with the stratification of the municipalities by region and demographic size. The unit and item non-response rates were reported to be 50% and 5% respectively, although it is

higher for the online banking question. The interviewed individuals are household heads (an individual who is primarily responsible for the household budget).

The Austrian survey is called the Survey of Household Financial Wealth and is administered by the Oesterreichische Nationalbank (National Bank of Austria). Data collected includes income, household composition, assets, debt, wealth and use of online banking. In 2004 2,556 households were interviewed in a multistage, stratified sampling design.

Table 1: Research Design

Step	Technology Adoption Model Review (1)	Socioeconomic Survey Review for IT related Questions (2)	Classification of Proxies (3)	Future Research Directions (4)
Input	TRA (Fishbein & Ajzen, 1975) TAM (Davis <i>et al.</i> , 1989) TPB (Ajzen, 1991) UTAUT (Venkatesh <i>et al.</i> , 2003) HIS (van Heijden, 2004) UTAUT2 (Venkatesh <i>et al.</i> , 2012)	Austria Canada Cyprus Finland Germany Italy Japan Luxemburg Norway Sweden UK US	UTAUT2 Demographic and social characteristics of Socioeconomic Surveys	Request that panels incorporate other IT-related questions (e.g., the socio-economic panel Germany 'SOEP' allows requests) Longitudinal Study on Italy Cultural Comparison of Italy 2002/2004 and Austria 2004
Outcome	UTAUT2 (Venkatesh <i>et al.</i> , 2012)	Austria Italy	UTAUT2 Proxies Model	

UTAUT2 PROXIES MODEL

There are nine *constructs* in UTAUT2. Figure 1 shows the constructs of UTAUT2 and potential socioeconomic proxies of those constructs available in public surveys. In the context of online banking the suitability of potential proxies for UTAUT2 constructs is discussed.

Performance expectancy is defined as the extent to which using a technology will provide benefits to a consumer in performing activities. Once technology is implemented, it may facilitate and often speed-up transactions (Laudon and Laudon 2013). In the context of online banking, users who possess their own business activities are likely to be in need of more transactions, which is why they may expect higher performance results of the system overall.

Effort Expectancy refers to the degree of ease associated with consumers' usage of technology. Age has been known to influence attentional demands or the ease of learning new things (Anderson *et al.* 1998, Smyth & Shanks 2011). One reason is that the perceived effort of learning increases with age. Thus, in the underlying context, age may have a general effect on online banking usage.

Social influence refers to consumers' perceptions of important related individuals. Related individuals may influence particular technology adoption. Also children may exert such a peer-pressure. Individuals with children may be more likely to adopt contemporary ICT.

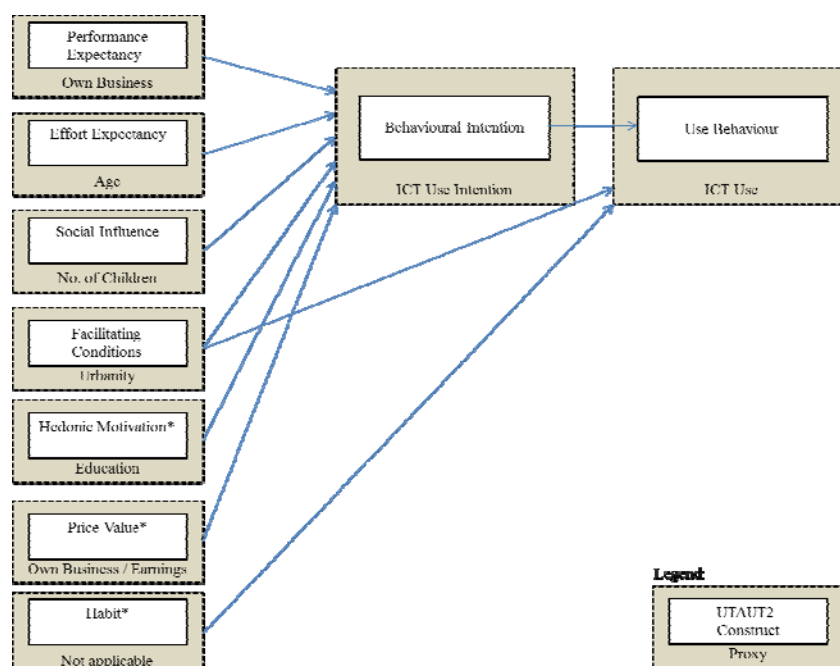
Facilitating conditions are the extent to which consumers perceive the availability of resources and support to perform actions. For this setting and ICT in general, more support can be expected in urban areas. For example, branches of banks from which technological support can be obtained may be closer or general courses which teach IT usage may be more readily available.

In the online banking setting, *hedonic motivation* refers to the pleasure derived from using ICT and is likely to play a minor role as the goal of the technology is oriented towards managing private financial circumstances. Nevertheless, to a certain extent, individuals who engage in formal education can be expected to find pleasure in acquiring new skills and knowledge. Thus, they may be more likely to adopt contemporary ICT just for the sake of acquiring new skills and experiencing pleasure.

Price Value refers to consumers' cognitive trade-off between perceived benefits and monetary costs of applications. ICT often benefit from economies of scale (Laudon & Laudon 2013). Once ICT are implemented, the marginal cost per additional transaction is close to zero. Thus, individuals who expect more transactions may perceive a more favourable cost/benefit ratio. It seems likely that people engaging in their own business activities do more bank transactions and thus, are more likely to adopt online banking. Another line of thought may be that individuals with higher earnings tend not to perceive as much disutility from costs as individuals with lower earnings; thus, leading to a more favourable cost/benefit ratio for higher incomes and a higher probability for IT adoption. Price value is also one major difference in technology adoption consideration between consumers and organizational users. Consumers, unlike employees, are responsible for costs incurred in the adoption of technology. Cost considerations can influence consumers' product decisions and hence technology adoption (Coulter & Coulter 2007).

Habit captures the degree to which individuals perform certain behaviour automatically and may reflect the results of prior *experience*. Experience refers to prior technology usage. The idea is that past technology use influences future technology use and adoption. These constructs are not applicable in this context as only the actual use of technology is taken as an outcome measure.

It needs to be noted, that the linking of UTAUT2 constructs to socioeconomic data is not mutually exclusive. It is, for example, conceivable that urban individuals have a stronger peer-pressure to use certain systems because of city trends. This may link the urban/rural indicator to UTAUT2's social influence construct. Another rational may be that children can influence the perception of the availability of support and may be seen as facilitators in the adoption of technology. Thus, the associations between the UTAUT2 constructs and the socioeconomic proxies are tentative and should be empirically examined.



Notes: Asterisks highlight the constructs which are relatively more important in consumer contexts than in organizational contexts and thus appear in the UTAUT2 (Venkatesh *et al.* 2012), but not in the UTAUT (Venkatesh *et al.* 2003).

Figure 1: UTAUT2 Proxies Model: unified theory of acceptance and use of technology in a consumer context (UTAUT2, Venkatesh *et al.* 2012) and demographic proxies for the theory's constructs

DISCUSSION

Our study suggests that the use of publicly available socioeconomic surveys is a potentially fruitful way to study technology adoption at a national and cross-national level. Our discussion suggests that several socioeconomic characteristics can be used as proxies in the UTAUT2 model.

While socioeconomic proxies might be more readily available than proxies based on survey instruments, they are not able to target precise psychological processes. Our investigation does not suggest that socioeconomic factors can replace TAMs that are based on precise measures and have helped us to understand human behaviour in more detail, but aims at adding an additional perspective

that could help practitioners and researchers understanding technology adoption within organizations, societies and also across countries.

In providing more readily observable proxies, managers and policymakers assessing scenarios for new technology introductions may use these indicators to understand the drivers of technology acceptance. We suggest some potentially useful proxies and provide a review on data sources. Information systems researchers can use these publicly available data sources to study ICT adoption on a cross-national and cross-cultural level. This, for instance, may eventually assist in proactively designing interventions (e.g., employee training, marketing, government initiatives) targeted at sections of the population that may be less likely to adopt and use potentially beneficial ICT.

Future research needs to empirically examine the validity of the suggested proxies. Researchers should also make requests that panels incorporate other IT-related questions. For instance, the socio-economic panel in Germany 'SOEP' considers requests.

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