

## **DRIVERS OF E-COMMERCE/E-BUSINESS SUCCESS: CONSTRUCTS, ANTECEDENTS & MODERATORS IN ADOPTION OF TECHNOLOGY ENABLED PRODUCTS & SERVICES**

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### *Abstract*

The success of E-business / E-commerce initiatives of brick and mortar organizations primarily depends on the acceptance and adoption of information technology based products and services by customers. In this paper the authors developed a framework based on available literature to understand what drives customer intention to adopt information technology enabled products and services. Using the technology acceptance model as a basis, the authors identify additional constructs; moderators and antecedents to better explain adoption. An approach to develop a detailed survey instrument is presented.

*Keywords: Technology adoption, financial products/services, information technology, E-Business/E-commerce*

### Background

One of the most significant developments in society over the past ten years has been the expansion of products and services to consumers through the use of information technology. The Internet, mobile telephones and Wi-Fi technology are some examples of technology platforms that have enabled products and services to be offered in new and innovative ways. As technology products and technology-enabled services have expanded, the need to better understand how users adopt technology and technology-enabled services has become increasingly important. Entire businesses such as Amazon, Google and Nokia have been built around the successful use of technology to provide products and services to customers while governments have also realized the transformative role this approach can play. The acceptance and adoption of technology based services and products is thus of central importance to organizations and governments.

### The Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was developed by Davis (1989) to predict individual adoption and use of information technology within a workplace environment. TAM posits that an individual's adoption and use of information technology is based on his or her behavioral intention (BI). TAM further hypothesizes that beliefs influence attitudes, which in turn leads to intentions that ultimately guide or generate usage. In terms of the model, BI is itself determined by two constructs, perceived usefulness (PU) and perceived ease of use (PEOU). Davis defines PU as "the degree to which a person believes that using a particular system would enhance his or her productivity", and PEOU as "the degree to which a person believes that using a particular system would be free of effort". TAM assumes that the intention to use a new information technology and the actual use of it, is influenced by the user perceptions of usefulness and ease of use.

TAM has proven over time to be the most influential technology adoption model in the field (Venkatesh & Morris, 2000, Venkatesh et.al, 2003). TAM as originally proposed has received considerable support in the domain of information technology acceptance and has proven to be a robust, as well as parsimonious

model in explaining user acceptance and usage behavior (Igbaria et al, 1997; Venkatesh & Morris, 2000, Venkatesh et al, 2003). The TAM model proposed by Davis is shown in figure 1.

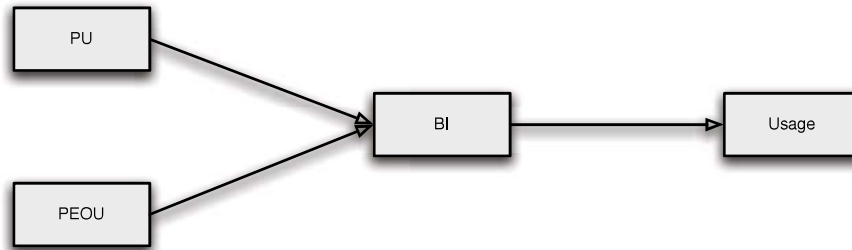


Fig.1: The technology acceptance model

Numerous researchers have studied the applicability of TAM beyond its initial application. Henderson & Divett (2003) tested the applicability of TAM within an electronic commerce setting. Their results indicated that TAM could be successfully applied to electronic commerce. Zhang & Prybutok (2003) studied consumers' online purchasing intention and confirmed the validity of TAM in an online shopping environment, while McCloskey (2003-2004) applied TAM to electronic commerce participation and validated its applicability. Amin (2009) investigated the factors influencing online banking acceptance in Malaysia and Rigopoulos & Askounis (2007) studied the same phenomenon in Greece. These studies confirmed the applicability of TAM in predicting online banking adoption.

#### The extension of TAM

We reviewed the literature on TAM and identified various additions that researchers have made to explain adoption of e-commerce and related technology enabled services. The authors specifically focused on TAM and the adoption of e-commerce. We specifically sought to determine if the modifications to TAM could be categorized in a manner would allow the classification of the various additions into a cohesive framework. Our work has shown that it is indeed possible to combine similar additions of TAM into more general terms allowing a simple manner to classify the various and numerous additions that researchers have made to TAM to better understand adoption of e-commerce and technology enabled services. We have found that the additions of researches can be classified into six additional constructs as well as four moderators and a single antecedent. We provide a summary of the additions in the sections below.

The most widespread modification to TAM was the addition of the attitude construct. This was found to be an important factor in consumer adoption of online commerce (Chen et.al, 2002; Vijayasarathy, 2004; Shih 2004). Other researchers have shown that individual attitudes toward e-commerce are strongly and positively correlated with user acceptance. Similar findings are also reported in studying the adoption of Internet banking. Researchers found substantial improvement in the prediction of technology adoption by consumers following the integration of attitudinal constructs into TAM. Self-efficacy is defined as the belief that one is capable of performing in a certain manner to attain certain goals. It is a belief that one has the capabilities to execute the courses of actions required to manage prospective situations. Self-efficacy has been identified by a number of researchers as an additional construct for TAM. Grandon and Pearson (2004); Wu and Wang (2005) and Wang et.al (2006) studied the role that a person's belief in their ability to make use of e-commerce or online services affects their intention to adopt the service, and found a positive correlation with adoption. These and other researchers have found that the inclusion of this construct in addition to the PU and PEOU of TAM improves the predictive power of TAM.

Task and task related variables are the third area in which researchers have added constructs to TAM. Task related constructs relate to how well the product or service meets the desired intent of the user. Task related constructs of execution time or ease of locating a provider are examples of task related variables. Researchers such as Purkayastha, 2009, Irani et.al 2009 and Garrison, 2009 have found that task related

variables such as availability of time and ease of locating a service provider determines intention to use a product or service. Trust as a construct was investigated by Pavlou (2003), Gefen (2003) and McCloskey (2006). These researchers found that a consumers' intentions to transact using e-commerce depend on both trust and the two beliefs identified by TAM, PU and PEOU. As technology has advanced and consumers adopt services such as online banking and e-commerce, trust related constructs have been found to directly influence adoption intent in users.

The final category of construct expansion in TAM are social and related constructs. Researchers such as Bandyopadhyay (2007) confirmed that social influence based in culture would provide additional explanatory power concerning consumers' intention to use a technology. Social norms and social risks (Riquelme & Rios, 2010) were found to influence the intention to adopt as was social influences (Irani et.al, 2009). As TAM has moved beyond its original field of information system adoption into consumer services the concept of fun and enjoyment has recently become an area for the addition of new constructs to explain adoption. Shang et.al (2005) and other researchers examined whether such intrinsic motivations can be used to explain consumers' acceptance of on-line shopping. Results showed that factors such as fun, enjoyment and pleasurable experiences were key determinants in users intention to use online shopping.

A framework for understanding customer adoption using TAM

In reviewing the extensions to TAM that researchers have added, we found that it is possible to combine several of these new factors into logical families. In addition to the original construct of TAM, i.e. PEOU and PU we have consequently identified six additional constructs that have been added to improve the predictive power of TAM in predicting adoption of e-commerce and related technology enabled services by consumers. These are tabulated below with the broad definition of the construct.

Construct	Definition
Attitudinal	Related to a persons attitude to a task or experience
Hedonistic	Related to personal reward, fun and enjoyment experienced through the execution of an activity or task
Self Efficacy	Related to an individuals self belief or their personal ability to succeed in a particular situation
Social	Related to the role individual or groups play in relation to the individuals perception about a task or activity
Task	Related to characteristics associated with the execution of a specific task or activity
Trust	Related to perceptions about riskiness, trustworthiness and beliefs about security

Table 1

In addition to the original and addition constructs of TAM identified, we further looked at factors that affect the strength of the relationship between constructs and behavioral intent. A moderator is defined as a variable that may alter the strength of the relationship between a construct and behavioral intent. The research papers were reviewed and moderating factors as defined by the authors or described as having a moderating effect on the relationship between construct and BI or actual usage was coded. Similar descriptors were then grouped and this resulted in four groupings of moderating factors as defined by these authors. This approach has been taken by a previous study (Sun & Zhang, 2006) in which they classified moderating factors into three groups.

The largest category of moderators identified was individual factors, such as age and gender. Agarwal & Prasad (1999), Venkatesh & Morris (2000), Al Sukkar & Hasan (2005), Venkatesh et.al (2003) and Sun & Yang (2006) found that individual factors such as age and gender moderated the relationship between PU and PEOU and BI across a range of e-commerce and financial technologies. An individual factor such as age determines to what degree a person may regard a potential service as useful. Other individual factors such as cultural background and intellectual capability have also been found to moderate the degree to which PU and PEOU influence the intention to adopt. Previous studies have also found that being compelled or choosing of one's free will determines the degree to which PU and PEOU determines BI (Venkatesh & Morris 2000, Hackbarth et.al, 2003). Notwithstanding the usefulness of a service potential customers will be more or less likely to adopt it depending on the level of coercion that may exist in the adoption intent.

Researchers have also identified the role of situational factors in the adoption decision (Dabholkar and Bagozzi, 2002; Hackbarth, 2003). An example of a situational factor may be waiting time in relation to utilizing a self-service kiosk. If a potential customer perceived that an extended waiting time may precede the use of a self-service kiosk this may reduce their perception of how useful such a service could be. The final moderator that researchers have identified is relevance. Relevance relates to an individuals perception that the task or activity is relevant to the desired outcome sought by the individual. If an individual perceives a potential service to be relevant the relationship between PU, PEOU and BI is positively moderated (Chan and Tan, 2004; Sauter, 2008). The role of the technology itself acting as a moderator of the relationship between constructs and BI has been investigated and defined by researchers (Venkatesh et.al 2002; AlAwadhi & Morris 2009). Technical problems and the availability of training on the technology are aspects that have been found to moderate the relationship between PU and intention. By following the same approach that we took with the additional constructs of TAM, we have been able to categorize the various moderators researchers have identified into four generic moderators, which we indicate in table 2 below.

Moderator	Definition
Individual	Related to characteristics associated with an individual and felt at a personal level
Relevance	Related to correlation between the task and the perceived desired outcome
Situational	Related to the specific situation the individual finds themselves in during the discharge of a task or activity
Technology	Related to the specific aspects of the technology or technology related component of the task

Table 2

The role of antecedents in TAM is an unclear one as there is not a standard and common definition among researchers. In terms of the definition chosen by these authors, an antecedent is a variable that is a precursor to a construct, but has not been identified as directly influencing BI, actual use, or in moderating the relationship between the constructs within TAM or its additions. Several researchers have added personality related variables which can be classified as antecedents in that they do not directly influence BI or usage, nor moderate a relationship between constructs. The role of personality related factors in understanding technology adoption has been studied recently by Neufeld et.al (2007), Devaraj et.al (2008) and Djamabi et.al (2010) who found that factors of personality including openness, agreeableness and neuroticism was an antecedent to both PU and PEOU.

This approach we have taken is akin to the development of the standard model in particle physics. We believe it is possible to consolidate the various additions of TAM into categories. We have reviewed the

additions and have been able to classify them into a framework that we believe will be able to handle all the additions to TAM in the recent past that deals with the adoption of e-commerce and online financial services. In this schema we have been able to accommodate all the recent research into six new constructs, 4 new moderators and a single antecedent. In doing so we believe we are able to not only accommodate all the additions but also provide a comprehensive addition to TAM. We further believe that this framework is such that not every situation will require every construct or moderator to explain the adoption situation. In some instances a particular situation may only require a mix of some of the variables, while in other situations a different mix of variable will be applicable. We content that while at first glance these two situations will produce different models of adoption, they in fact are variations on a single framework.

A research tool for testing the framework

An interrogation of the literature reveals that studies that validate TAM consistently use a structured questionnaire-based approach to gather data and Structural Equation Modeling (SEM) to develop a model that recognizes the relationship between the various constructs and BI. The advantages of using a structured questionnaire based approach include being easy to administer, the ability to collect a large amount of data in a relatively short period of time, reduction in bias as opposed to the unstructured questionnaire method and ease of coding and analysis compared to alternative methods of data collection. Following the collection of data, researchers have then typically applied a SEM approach to determine the strength of the relationships between the various constructs of TAM and in so doing develop a model that explains the specific adoption decision. We propose that the same approach should be followed when testing our proposed framework. In doing so we would be making use of a well-validated technique for testing the proposed framework. We consequently propose to develop a questionnaire based research tool to test the framework.

In developing a questionnaire a review of available literature will be undertaken to determine typical questions that have been asked by previous researchers to test TAM in various settings. Only papers in which researchers have used a questionnaire-based approach will be considered, and only those that have tested TAM in the adoption of technology enabled products and services. By classifying the questions against the various constructs the researchers have used a database of possible questions for each construct tested will be developed. The approach we are proposing follows the principles of grounded theory. Once a consolidated database has been developed the consolidated framework proposed above will be used to classify all the questions into the six constructs, four moderators and one antecedent plus the original TAM constructs of PU and PEOU. Key words that appear consistently across questions within each construct, moderator and antecedent will be extracted. The keywords will form the basis of the questions that we intend to use in our questionnaire, and the questions will be reworked to ensure they are asked in a manner that the intended subjects can easily understand. The goal of this approach will be to develop questions that will most effectively test the various variables of the framework in the chosen field setting.

Conclusion

TAM has been expanded to accommodate the adoption of technology and technology-enabled services in areas such as the e-commerce, mobile phones and online banking. Researchers have added new variables to the original model of TAM proposed by Davis, to accommodate adoption in these settings. At first glance the addition of these variables, many of them unique to a specific adoption situation, may appear confusing or contradictory. In the first instance we propose it is possible to categorize the additional variables into a comprehensive framework of six additional constructs, four moderators and one antecedent that accommodates all these additions. In the second instance we propose a questionnaire based methodology that can be used to test the validity of the framework and to determine the relationships and relative importance's of the constructs, moderators and antecedents in understanding the adoption of technology based services such as e-commerce and financial services.

In the future the authors propose to develop this approach further and test the framework through a questionnaire-based approach in the field. The framework and all its variables as well as the technique we have described will be put to use in a developing country to test consumer adoption of technology-enabled services. We will also use the opportunity to address a further weakness in research into TAM – that of small sample size, limited geographical spread and narrow test groups. We believe that such research will provide a very useful contribution into the field of adoption of technology enabled products and services in developing countries.

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