

4th World Conference on Business, Economics and Management, WCBEM

# The Technology Acceptance Model E-Commerce Extension: A Conceptual Framework

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## Abstract

Electronic-commerce has become an important channel for conducting business. Researchers as well as market executives are trying to better understand online consumer behavior. One model used by researchers to understand behavior in the information systems field in general is the technology acceptance model (TAM). The TAM variables are perceived usefulness, perceived ease of use, and intentions. In this study, we suggest the extension of the TAM for its application in the E-commerce field. The original TAM will be extended, by adding four predictor variables. The four predictor variables are process satisfaction, outcome satisfaction, expectations, and E-commerce use. In addition, the TAM will be extended by measuring actual behavior as opposed to measuring intentions as a substitute for actual behavior in previous TAM application studies. We suggest measuring actual use variable in terms of four criterion variables, namely, purchase, access number, access total time, and access average time. The extended TAM is expected to better explain actual behavior in E-commerce environments than the original TAM.

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Peer-review under responsibility of Academic World Research and Education Center

**Keywords:** Technology Acceptance Model; User Satisfaction; Process Satisfaction; Outcome Satisfaction; Intentions; Actual Behavior; Behavioral Expectations; E-commerce

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## 1. Introduction

Electronic-commerce (E-commerce) is defined as all aspects of business and market processes enabled by the Internet. E-commerce is rapidly becoming a viable means of conducting business, as evidenced by the tremendous amounts of money spent online. The United States online retail sales are estimated to reach \$278.9 billion in 2015 as reported by Forrester Research (Mulpuru, 2011). As a result, the economic impact of E-commerce is increasing exponentially. Web based companies, Net Enabled Organizations (NEO), and researchers are still trying to understand and predict online consumer behavior; therefore, research in this area is needed.

Information systems (IS) researchers have explored online consumer behavior in terms of online shopping adoption (Bhattacharjee, 2001; Gefen, Karahanna, & Straub, 2003b; Gefen & Straub, 2000; Koch, Toker, & Brulez, 2011; Koufaris, 2002). The most widely referenced adoption model in IS research is Davis's (1989) technology acceptance model (TAM) (Gefen & Straub, 2000). The TAM is an adaptation of the theory of reasoned action (TRA) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975) for predicting IS adoption (Davis, Bagozzi, & Warshaw, 1989). The TAM has two elements, perceived usefulness (PU) and perceived ease of use (PEOU), that are correlated with the decision to adopt a new technology (Davis, 1989). Although designed to explain new technology adoption, not specifically E-commerce behavior, researchers have recently used the TAM to explore Internet consumer behavior (Bhattacharjee, 2001; Gefen et al., 2003; Gefen & Straub, 2000; Koch, et al., 2011; Koufaris, 2002).

We argue that the TAM in its current form cannot be used to fully explain online consumer behavior as E-commerce adoption is considerably different from new technology adoption in an organization. One difference is that the decision to buy online is voluntary, while the decision to use new software in an organization is typically mandated by organizational policy. Also, shopping online is one choice among alternatives (e.g. shopping in a conventional store) for the shopper, while more often than not there is no choice among different software or systems mandated by an organization. Although the use of the TAM, as it was originally conceived, is not likely to lead to a full explanation of online consumer behavior, an E-commerce specific, extended TAM may prove useful in explaining such behavior. Hence, there is a need to extend the TAM to serve as an E-commerce adoption model.

## 2. Theoretical Background

Before developing our model we examined the published body of knowledge about the topic. Our review and evaluation of the literature are presented in the following section. Based on that evaluation and grounded in the literature, our new TAM extending variables are identified.

### 2.1. The Theory of Reasoned Action

In order to develop an extended model of the TAM with solid conceptual foundations, we need to fully understand its antecedents. The TAM's major antecedent is the TRA (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). The TRA (Fig.1) is a model developed to predict human behavior in general. Two main elements, attitude towards a behavior and subjective norm, are identified as determinants of behavior (Fishbein & Ajzen, 1975). An attitude towards a behavior is "an individual's positive or negative feelings (evaluative affect) about performing the target behavior" (p. 216). A subjective norm is "the person's perception that most people who are important to him think he should or should not perform the behavior in question" (p. 302). A person's attitude towards a behavior is determined by that person's beliefs about that behavior. In addition, a person's subjective norm towards a behavior is determined by that person's normative beliefs about that attitude (Fishbein & Ajzen, 1975).

Researchers using the TRA as a behavioral intention model should be able to predict the performance of any voluntary act, unless intent changes between assessment and performance of that behavior. Researchers should also be able to predict whether a behavior will occur. However, choice among alternative behaviors was not included (Fishbein & Ajzen, 1975).

People have different sets of beliefs about each behavior. As such, researchers developing behavioral adoption models have to generate the behavior's related belief set. Moreover, the performance of a certain behavior might lead to new beliefs, which might influence the attitude and, thus, performance (Fishbein & Ajzen, 1975).

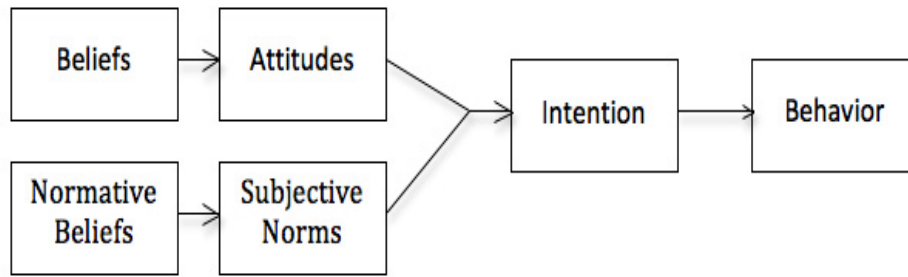


Fig. 1. The Theory of Reasoned Action

A meta-analysis of past TRA research was conducted by Sheppard, Hartwick, and Warshaw (1988) to investigate the relationship between intention to perform a behavior and the actual behavior. The research reports on the TRA were published in the *Journal of Consumer Research*, the *Journal of Marketing*, the *Journal of Marketing Research*, *Advances in Consumer Research*, the *Journal of Personality and Social Psychology*, the *Journal of Experimental Social Psychology*, the *Journal of Social Psychology*, the *Journal of Applied Social Psychology*, and the *Journal of Applied Psychology* prior to 1987. Studies were rejected if the authors had failed to measure all the variables in the TRA, or did not include bivariate/multivariate correlation, or did not use measures that corresponded with the behavior/intention that was studied. Sheppard and his associates reported that the TRA was effective in predicting different behaviors (e.g., study a few hours, go to a weekend job, or write a letter). The frequency-weighted-average correlation was 0.53 for the intention/behavior relationship, and 0.66 for the (attitudes and subjective norm)/intention. They also reported that behavior was predicted using the TRA even in situations that fell outside the boundary conditions set for the model (e.g., behavior involving an explicit choice among alternatives) (Sheppard et al.). Thus, the robustness of the TRA was established.

## 2.2. The Technology Acceptance Model

The TRA provided the theoretical framework used by Davis (1989) to study technology adoption behavior. A belief set for adopting technology was generated by Davis in consistence with Fishbein and Ajzen's (1975) recommendation. The belief set consisted of two elements, perceived usefulness (PU) and perceived ease of use (PEOU). Davis (1989) defined PU as "the degree to which a person believes that using a particular [information] system would enhance his or her job performance" (p. 320), and PEOU as "the degree to which a person believes that using a particular [information] system would be free of effort" (p. 320). A visual representation of the elements in the TAM is presented in Fig. 2.

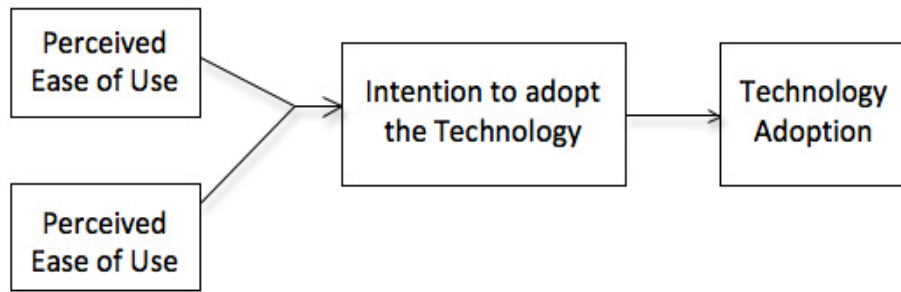


Fig. 2. The Technology Acceptance Model

### 2.3. TAM Application and Extension Studies

Other studies with the purpose of applying and/or extending the TAM followed. In a study to apply the TAM in a computer technology adoption instance while comparing it to the TRA, the relationship between PU and PEOU (specific beliefs about technology adoption in the TAM) and attitudes (elements in the TRA) was tested (Davis et al., 1989). PU scores were associated with reported intentions to use an information system. In addition, PU scores were strongly related to reported intentions to use the system because in the work environment, intention to use a system may be based on anticipated performance outcome irrespective of an overall attitude towards the system. Employees might have a negative attitude towards a system, but yet use it because they perceive it to be advantageous in terms of job performance (Davis et al., 1989).

In another study to evaluate the TAM (Szajna, 1996) subjects' PU, PEOU, intentions to use an email system, as well as self-reported usage were measured. In addition, actual usage of was measured as the number of computer logs of messages sent. PU scores explained 52% of the variance in reported intention to use the electronic mail system. Reported intention to use the system scores explained 32% of the variance in subjects' self-reported usage of the electronic mail system and only 6% of the variance in actual usage of the system. Warning was raised against the substitution of self-reported usage for actual usage of information systems in future research (Szajna, 1996).

In a study with the purpose of reviewing user acceptance models (TAM and TRA among them) and formulating a unified model of technology use, (Venkatesh, Morris, Davis and Davis, 2003) a measure of intention to use a technology to predict adoption of that technology was employed. A longitudinal study of four new technologies at four different organizations was conducted for both voluntary and mandatory use. Reported intention to use the technology explained 59% of the variance in subjects' self-predicted use of the technology. The authors suggested that the behavioral expectations (Warshaw & Davis, 1985) about usage should be studied in future technology adoption research in order to account for additional variance in behavior. They also recommended that researchers study the relationship between user acceptance of the technology and the outcomes of technology usage. Little or no research has been conducted to address this relationship, they reported. They also suggested that technology adoption be studied in non-organizational settings, namely E-commerce (Venkatesh et al., 2003).

In research on E-commerce, the TAM was applied and extended (Koufaris, 2002) by adding consumer shopping enjoyment to PU and PEOU as predictors of intention to return to a web site for future shopping. PU, PEOU, and shopping enjoyment scores explained 54% of the variance in intention to return to the web site for future shopping. This study confirmed, in E-commerce, the previous TAM research results concerning the importance of PU in predicting intentions to use a system (Koufaris, 2002).

The TAM was extended by adding consumer trust in the electronic vendor (E-vendor) as a determinant of intention to shop online (Gefen et al., 2003b). Intention to use E-commerce was defined as the intention of the subject to provide his or her credit card numbers and personal information to the E-vendor. Actual shopping behavior was not measured. PU was a stronger predictor of intended E-commerce use than was PEOU or trust. The path loading from consumer trust to intention to shop online was .26. The path loading from PEOU to intention was

also .26. However, the path loading from PU to intention to shop online was .40. The authors acknowledged that the conceptualization of intended behavior in their study was narrow even though it captured two essential aspects of online purchasing: intention to give credit card number and personal information to the E-vendor. They suggested that future researchers include an overall measure of intention to shop from the E-vendor again. They also suggested that future researchers include in their studies other measurements of intention to use E-commerce (Gefen et al., 2003b).

#### *2.4. E-commerce and User Satisfaction*

User satisfaction is a potentially important variable in IS and the online environment research. In discussing the online environment, Szymanski and Hise (2000) first used the term E-satisfaction (Gefen & Straub, 2000) to refer to customer satisfaction with an E-retailer. Six correlates of E-satisfaction were identified: convenience, product offerings, product information, site design, and financial security. The relationship between E-satisfaction and intention to use E-commerce was not tested (Szymanski & Hise, 2000).

Although other researchers have studied user satisfaction with E-commerce (Bechwati & Xia, 2003; Devaraj, Fan, & Kohli, 2002; Kim & Lim, 2001; McKinney, Yoon, & Zahedi, 2002; Otto, Najdawi, & Caron, 2000), none have reported a test of the relationship between E-satisfaction and E-commerce use or intention to use.

In user satisfaction with information systems studies, IS researchers have used user satisfaction measurement instruments (Bailey & Pearson, 1983; Doll & Torkzadeh, 1988) that were not balanced between process and outcome satisfaction items. Revising the instruments to include items for both process and outcome satisfaction was recommended for future IS user satisfaction research (Woodroof & Kasper, 1998).

Based on the above review of TAM and E-commerce related literature, the following variables were identified in order to extend the TAM to better serve as an E-commerce adoption model. The variables are process (Woodroof & Kasper, 1998) of E-commerce use satisfaction, outcome (Woodroof & Kasper, 1998) of the online shopping experience satisfaction, behavioral expectations (Venkatesh et al., 2003) about E-commerce use.

### **3. Evaluation**

The TAM application and extension studies presented above are a representative sample of the plethora of such studies. There exist, to our knowledge, around 100 TAM application and extension studies. After thorough review of these studies, we detected the following assertions. First, PU is a strong predictor of behavioral intentions in different environments (E-commerce and non E-commerce). Second, there is a relationship between PU and PEOU. This relationship is evident in different environments (E-commerce and non E-commerce). Third, there is a need to measure actual use instead of substituting it with behavioral intentions. Also, there is a scarcity of TAM studies measuring actual use. In fact, all the TAM studies we examined, with the exception of three (Straub et al., 1995; Szajna, 1996; Venkatesh et al., 2003), used intention or self-reports as a substitute measure for behavior. Fourth, we identified PS and OS as possible predictor variables of both behavioral intentions and actual use. Fifth, there is a need to study behavioral expectations in addition to behavioral intentions when predicting behavior using the TAM.

### **4. Suggested Extended TAM Model**

Grounded in the TAM and E-commerce related literature, and following our evaluations of that literature, we identified the following variables that we used to extend the TAM to potentially better serve as an E-commerce adoption model. The predictor variables are satisfaction with process (Woodroof & Kasper, 1998) of E-commerce use, satisfaction with outcome (Woodroof & Kasper) of E-commerce use, and behavioral expectations (Venkatesh et al., 2003) about E-commerce use. In addition to these extended TAM variables, we added a criterion variable, namely an actual measure of E-commerce use (Szajna, 1996; Venkatesh et al.). The proposed model is presented in Fig. 3.

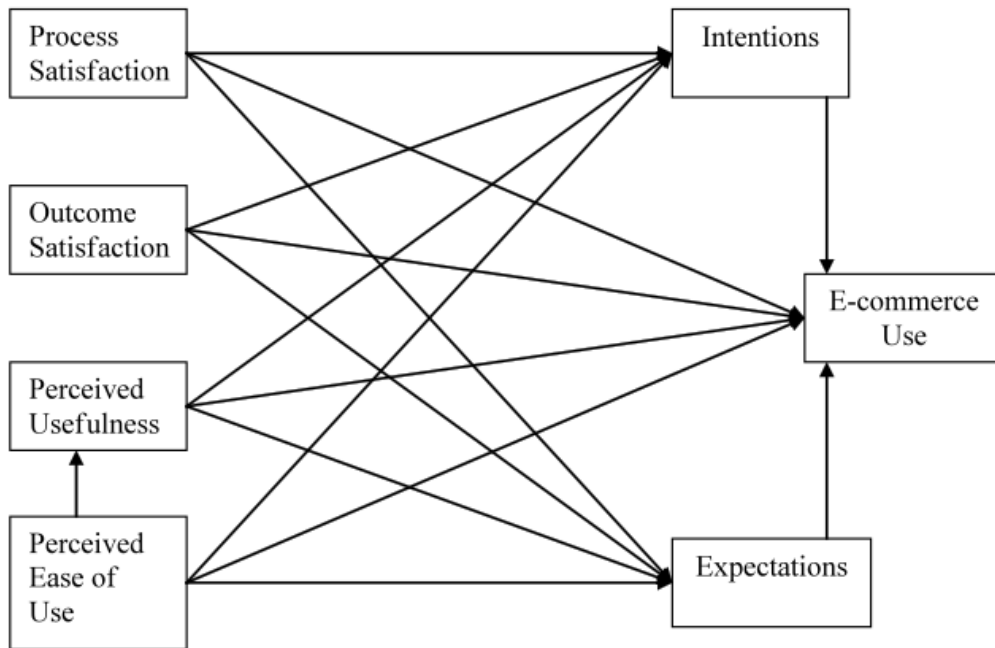


Fig. 3. The Extended Technology Acceptance Model

## 5. Conclusion

Since there is a plethora of TAM studies, what is the value of one more? If a new TAM study measured actual behavior as per the recommendation of Davis (1989), it would address one of the limitations of the original TAM and potentially confirm its robustness. In addition, if such a study applied the TAM in a different environment than the original, it would potentially provide more evidence of the TAM's generalizability. Our study is thereby valuable as it is aimed at supporting the robustness and generalizability of the TAM.

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