

# ON THE EXPLANATION OF FACTORS AFFECTING E-COMMERCE ADOPTION

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# ON THE EXPLANATION OF FACTORS AFFECTING E-COMMERCE ADOPTION

## Abstract

The Internet has grown at a remarkable pace since the emergence of the World-Wide Web in the early 1990s. While electronic commerce (e-Commerce) has become an important issue with the growth of the Internet, there has been insufficient empirical research concerning its adoption by Internet users.

In this paper, we propose the e-Commerce Adoption Model (e-CAM), which attempts to examine important factors that predict a consumer's online purchasing behavior. e-CAM integrates the technology acceptance model with the theories of perceived risk to explain the adoption of e-Commerce. Specifically, we examine the impact of the following factors on the consumer's purchasing behavior: perceived ease of use, perceived usefulness, perceived risk with products/services, and perceived risk in the context of online transaction. We test the e-CAM model using the structural equation modeling technique. Most of the causal relationships between the constructs postulated by our model are well supported, accounting for 33.4 percent of the total variance in e-Commerce adoption.

In sum, our study finds that all of the antecedent constructs directly and/or indirectly affect the consumer's adoption of e-Commerce. Therefore, the findings suggest that firms providing products/services through e-Commerce should consider these contextual factors in order to facilitate consumers' adoption behavior.

Keywords: e-Commerce, Technology Acceptance Model, Perceived Risk, Perceived Ease of Use, Perceived Usefulness

## 1. INTRODUCTION

The explosive increase of Internet users has led to dramatic shifts in the way of conducting business. From our daily lives to commercial transactions between businesses, the Internet has profoundly impacted and changed the way we do business. e-Commerce presents enormous opportunities for both consumers and businesses in the world.

While e-Commerce has proliferated with the growth of the Internet, there have been insufficient empirical research efforts concerning its status and consumer behavior over the Internet. We believe that there may be some valid factors to explain the consumer's adoption of e-Commerce. In this study, we propose and validate the *e-Commerce Adoption Model (e-CAM)*, which is derived from the theoretical foundations of prior research in the theories of perceived risk as well as the technology acceptance model. Specifically, we examine the impact of the following factors on the consumer's purchasing behavior: perceived ease of use, perceived usefulness, perceived risk with products/services, and perceived risk in the context of online transaction. We demonstrate not only what contextual constructs make a consumer adopt or reject e-Commerce as a purchasing vehicle of products/services, but also how these contextual differences influence the consumer's adoption behavior.

The remainder of this paper is organized into the following five sections. The first section provides a brief review of the literature on technology acceptance model and theories of the perceived risk. Next, we present our research model and a set of research hypotheses based on the theories in the preceding section. Then, we discuss our research methods used to test the proposed model and present the analysis and results of our study. Finally, we make conclusion by discussing the implications of our study, followed by presenting limitations and future research direction.

## 2. THEORETICAL BACKGROUND

### 2.1. *Technology Acceptance Model*

IS researchers have made significant efforts in building theories to examine and predict the determinant factors of information technology (IT) acceptance. The technology acceptance model (TAM) adapts the belief-attitude-intention-behavior relationship to a user's IT acceptance. The purpose of TAM is to explain and predict IT acceptance and facilitate design changes before users have experience with a system. TAM predicts user acceptance based on two specific behavioral beliefs: perceived ease of use (PEU) and perceived usefulness (PU), which determine an individual's behavior intention (BI) to use an IT ((Davis et al. 1989)).

Significant empirical researches have examined the TAM's overall explanatory power and measurement validity in different settings characterized by constructs, type of IS, etc. Originally investigating e-mail, word processing and graphics software, TAM has been extended its application to diverse types of IS, such as DBMS ((Szajna 1996)), personal computing ((Agarwal et al. 1999)), and some other software ((Venkatesh 1999); (Venkatesh et al. 2000)). Furthermore, several recent studies ((Lederer et al. 2000); (Lin et al. 2000); (Teo et al. 1999)) have examined TAM to analyze users' behavior on the Internet, specifically the WWW.

Based on empirical evidence, the attitude construct (A) was left out from the original TAM model because it did not fully mediate the effect of PU on behavioral intention (BI) ((Venkatesh 1999)). In addition, several studies ((Gefen et al. 1997); (Lederer et al. 2000); (Straub et al. 1995); (Teo et al. 1999)) have disregarded the effect of PEU/PU on A and/or BI. Instead, they focus on the impact of PEU and/or PU directly on the actual system usage. As our research focuses on consumers' actual usage on e-Commerce, we adapt the TAM model by dropping A and BI, as illustrated in Figure 1.

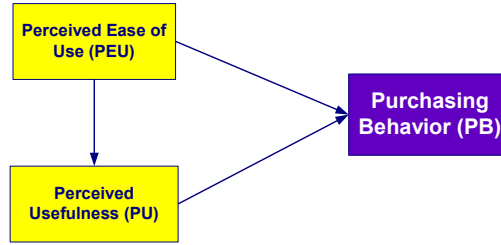


Figure 1: Adapted TAM Model

Consumers can access thousands of online sites and purchase anything from groceries to books and cars without traveling to a store site or adjusting his schedules around the store's hours. Recognizing that customers may want products/services delivered as soon as possible, many e-Commerce sites offer next-day or second-day delivery. Furthermore, e-Commerce consumers can view catalogs of different products/services and read extensive information detailing their features and performance while information acquisition was time-consuming and difficult prior to the outset of the Internet. Therefore, we recognize *ease of information search, ease of ordering, ease of using customer service, and overall ease of use* as consumers' PEU. In addition, we measure PU by the following factors: *saving of money, saving of time, vast selection of products/services, and overall usefulness*.

## 2.2. Theories of Perceived Risk

Since Bauer ((Bauer 1960)) first proposed that consumer behavior be seen as risk taking, valuable empirical researches have attempted to identify various types of perceived risk in the context of consumers' purchase behavior.

### 2.2.1. Perceived Risk with Product/Service

Cox and Rich ((Cox et al. 1964)) refer to perceived risk as the overall amount of uncertainty perceived by a consumer in a particular purchase situation. Jacoby and Kaplan ((Jacoby et al. 1972)) classified consumers' perceived risk into the following five types of risk: physical,

psychological, social, financial, and performance (functional). Chaudhuri ((Chaudhuri 1998)) stated that low levels of perceived risk in products are related to high levels of positive feelings during consumption. Sweeney et al. ((Sweeney et al. 1999)) defined perceived risk as the subjective expectation of a loss and included financial and performance risk, which can be viewed as an expectation of a future cost.

As we cannot directly see or touch product/service in the electronic market, product/service delivered to consumers may not perform as expected. In addition, consumers may bear the expenses such as shipping and handling when returning or exchanging the product/service. Among the five risk types that Jacoby and Kaplan ((Jacoby et al. 1972)) propose, we recognized *functional loss* and *financial loss* as risk types related to product/service. Further, we may waste time, convenience, and effort getting it adjusted or replaced when purchased products/services fail. Although time is non-monetary effort and varies among individuals, we recognize time as a cost that consumers must pay for products/services ((Sweeney et al. 1999)). After purchasing product/service over the Internet, consumers may find a product/service of equal or higher quality at a lower price. Thus, we recognized another perceived risk, *opportunity loss*, which is the risk that by taking one action a consumer will miss out on doing something else he/she would really prefer to do.

Finally, we define perceived risk with product/service (PRP) as the overall amount of uncertainty or anxiety perceived by a consumer in a particular product/service when the consumer purchases online. Further, we identify five types of PRP: *functional loss*, *financial loss*, *time loss*, *opportunity loss*, and *overall perceived risk with product/service*.

### 2.2.2. Perceived Risk in the Context of Online Transaction

Several research on the context of online transaction ((Hoffman et al. 1999); (Jarvenpaa et al. 1999); (Swaminathan et al. 1999)) suggest that consumer's confidence or trust will be improved by increasing the transparency of the transaction process, keeping to a minimum the personal data required from the consumer, and making clear the legal status of any information provided. Bhimani ((Bhimani 1996)) suggests the fundamental requirements for e-Commerce that satisfies the following security issues: authentication, authorization, availability, confidentiality, data integrity, nonrepudiation, and selective application services. Swaminathan et al. ((Swaminathan et al. 1999)) assert that consumers evaluate online vendors before they do online transactions and therefore vendors' characteristics play an important role in facilitating the transaction. Rose et al. ((Rose et al. 1999)) state that if people do their transactions with dishonest merchants or if sensitive information is stored on unsecured databases, security threats exist even where data is perfectly secure in transmission.

Therefore, we define perceived risk in the context of online transaction (PRT) as a possible transaction risk that consumers can face when exposed to electronic means of doing commerce. Finally, four types of PRT are identified as follows: *privacy*, *security (authentication)*, *nonrepudiation*, and *overall perceived risk on online transaction*.

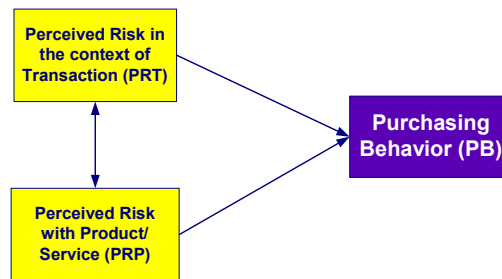


Figure 2: Perceived Risk Model

Based on previous research on the perceived risk, we propose a theoretical model that postulates perceived risks as the antecedents to the adoption as represented in Figure 2.

### **3. RESEARCH FRAMEWORK**

#### **3.1. Research Hypotheses**

In this section, we propose several hypotheses regarding consumers' adoption of e-Commerce based on each construct that was derived from the pervious literature.

##### **3.1.1. Perceived Risk in the Context of Online Transaction**

As suggested in numerous studies, a commonly recognized barrier to the diffusion and adoption of e-Commerce has been the lack of security and privacy over the Internet. Messages on the Internet are being passed in a shared domain, and therefore consumers are not yet comfortable with sending personal information across the Internet ((Rose et al. 1999)). Most online vendors allow consumers to pay through credit card, which effectively limits the number of consumers immediately. Security concerns with respect to exposure of credit card information to hackers or unknown vendors is still a major anxiety for consumers ((Swaminathan et al. 1999)). According to the study of Hoffman et al. ((Hoffman et al. 1999)), 95% of Web users have declined to provide personal information to Web sites at one time or another when asked, and 40% who have provided demographic data have gone to the trouble of fabricating it. Further, Bhimani ((Bhimani 1996)) state that consumers may be afraid that online vendors can deny an agreement after the transaction. The higher concerns for privacy, security, and vendors' trust a consumer perceives in the e-Commerce transactions, the lower the usefulness of e-Commerce will be for the consumer. In this context, we believe that consumers' PRT would decrease their usefulness



(PU), and ultimately discourage consumers from their adoption on e-Commerce. Accordingly, we propose the following hypotheses:

H-1a: *PRT is negatively related to PU.*

H-1b: *PRT negatively affects consumer's purchasing behavior in e-Commerce (PB).*

### **3.1.2. Perceived Risk with Product/Service**

As Sweenley ((Sweeney et al. 1999)) mentioned that each of a consumer's risk types is interdependent, it is assumed that the anxiety or uncertainty with product/service (PRP) is correlated to PRT. Online consumers may also feel anxiety when they do transactions on the Internet because of the intangibility characteristics of the product/service. PRP, therefore, reduces consumers' overall usefulness that the consumers obtain from shopping on the Internet. Further, PRP will put a damper on consumer's adoption of e-Commerce. Therefore, the following hypotheses are proposed:

H-2a: *PRP is positively correlated with PRT.*

H-2b: *PRP is negatively related to PU.*

H-2c: *PRP negatively affects PB.*

### **3.1.3. Perceived Ease of Use**

Information systems that users perceive easier to use and less complex will increase the likelihood of its adoption and usage ((Teo et al. 1999)). According to several research on TAM ((Davis et al. 1989); (Teo et al. 1999)), PEU has been shown to influence behavior (i.e., IT adoption) through two causal ways: (1) a direct effect on behavior and (2) an indirect effect on behavior via PU. Therefore we propose the following hypotheses:

H-3a: *PEU is positively related to PU.*

H-3b: *PEU positively affects PB.*

### 3.1.4. Perceived Usefulness

Numerous empirical studies have already validated the relationship between PU and user acceptance of information systems. Therefore, it is expected that consumers will adopt e-Commerce if they perceive e-Commerce would help them to attain desired performance. In this context, we propose a hypothesis as follows.

H-4: *PU positively affects PB.*

### 3.2. Research Model

The research model to be empirically tested in the study is illustrated in Figure 3. Our model, called the *e-Commerce Adoption Model (e-CAM)*, is derived from the theories and hypotheses described in the preceding sections. e-CAM suggests that PEU, PU, PRP, and PRT will have impact on the consumer's adoption of e-Commerce.

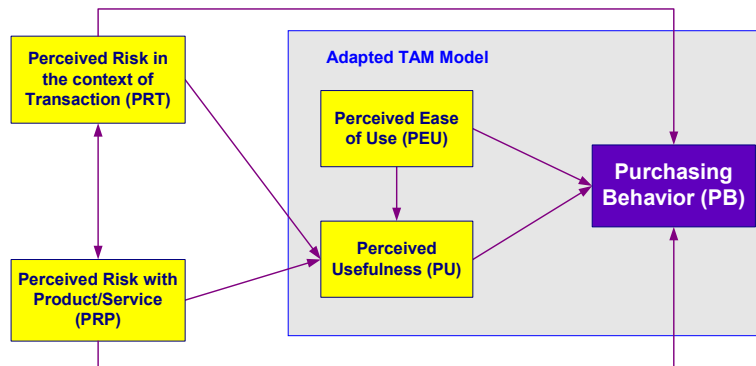


Figure 3: e-Commerce Adoption Model

## 4. RESEARCH METHODS

### 4.1. Questionnaires Generation

With regard to the independent variables, we derived questions to measure the PU and PEU constructs based on Davis's TAM model and the PRP and PRT constructs from the earlier research on perceived risk. Measurement of the PEU construct stresses on how comfortable consumers will be with e-Commerce as a purchasing medium. For the measurement of the PU construct, the influence of e-Commerce on consumers is emphasized. In order to measure the PRP construct, we focus on the risk factors regarding product/service that discourage consumers from doing online transaction. For the measurement of the PRT construct, transaction security and privacy on the Internet are stressed.

The dependent variable of the study, the consumer's online purchasing behavior (PB), was measured in two ways: (i) the frequency of online purchases, and (ii) the total amount spent on online purchases. We referred to the previous research and survey on the Internet usage, such as the GVVU's 10th WWW User Surveys ((GVVU's WWW User Survey Team 1998)), to develop the questions regarding the dependent variable and other demographic variables.

The questionnaires were initially pretested with several graduate students who enrolled in a large University and resulted in removing and rewording some unclear questions. Finally, the questionnaires are mainly divided into five categories: e-Commerce Usage (3 items), PEU (4 items), PU (4 items), PRP (5 items), PRT (4 items). Each item of independent variables was assessed with a 7-point scale with end points of 'strongly disagree' and 'strongly agree.' With regard to the dependent variables, the frequency of online purchases was measured with 5-point scales ranging from 'none' to 'more than 10 times,' and the total amount spent on online purchases with 8-point scales ranging from 'none' to 'more than \$2,000.'

## **4.2. Sample & Procedures**

As Tan and Teo ((Tan et al. 2000)) state, Web-based surveys are appropriate when the target subjects are Internet users and a short time frame for responses is required. This study was carried out through the Web-based survey methodology because our study focuses on consumers who have ever experienced the Internet. The questionnaires were posted on the Web using Java Servlet, and we utilized JavaScript to check for missing responses and prompt users to answer them.

Subjects for the study were mostly undergraduate and MBA students at two major Universities in the United States. As incentives for participation, subjects received participation credit and we promised to send an executive summary of the results to the respondents. Although numerous studies have used student subject for developing and validating theories on IT diffusion and adoption, this subject may cause a sampling bias (i.e., external validity problem). However, we believe that the students will finally grow to be the most active Internet users and influential consumers in the online market, and therefore understanding of potential consumers' needs in e-Commerce is very imperative to predict future trends on the adoption of e-Commerce. The survey lasted about a month and elicited a total of 183 responses. Among these responses, 176 were valid for the analysis.

## **4.3. Data Analyses**

### **4.3.1. General Statistics**

Males and females consist of 66.5% and 33.5% of respondents respectively, quite similar to the result of the Gvu's 10<sup>th</sup> WWW User Surveys ((Gvu's WWW User Survey Team 1998)) (66.4%: 33.6%). The ages of the overall majority of respondents are between 16 and 35 (89.2%).

Further, all the respondents are highly educated with at least some college experience, which is

also similar to the result of the GUV's surveys (87.8%). With regard to the connection speed, approximately 42% of the respondents have high connection speed faster than 56 kb/sec. This result is coherent to the finding of a survey that fewer than half are very interested in having a high-speed connection ((Rose et al. 1999)). More than half of the respondents access the Internet primarily at home, and most of the respondents have more than 2 years of experience on the Internet.

### 4.3.2. Online Purchasing Statistics

As shown in Table 1, the majority of respondents (93.2%) have visited an online shopping mall, and most of the visitors (87.5%) have purchased product/service via the Internet at least once.

<b>Online Shopping-Mall Visiting Experience</b>			
• Yes	164 (93.2%)	• No	12 (6.8%)
<b>Total Amount of Online Purchasing</b>			
• None	22 (12.5%)	• Less than \$50	19 (10.8%)
• \$50-\$99	21 (11.9%)	• \$100-\$199	24 (13.6%)
• \$200-\$499	37 (21.0%)	• \$500-\$999	21 (11.9%)
• \$1,000-\$2,000	8 (4.5%)	• More than \$2,000	24 (13.6%)
<b>Frequency of Online Purchasing</b>			
• None	22 (12.5%)	• 1-2 times	50 (28.4%)
• 3-5 times	64 (36.4%)	• 6-10 times	20 (11.4%)
• More than 10 times	20 (11.4%)		

Table 1: On-Line Purchasing Statistics

## 4.4. Validating the Instruments

### 4.4.1. Reliability

In this study, the internal consistency reliability is measured by applying the Cronbach's alpha test to the individual scales and the overall measure as reported in Table 2. As the alpha values for all the constructs in our study are greater than the guideline of .70 as specified by Nunally ((Nunally 1978)), we conclude that the scales can be applied for the analysis with acceptable reliability.

Factors and Scale Items	Mean	SD	Cronbach $\alpha$
<b>Perceived Ease of Use (PEU)</b>			<b>.7793</b>
• Easy to locate desired information	5.392	1.361	
• Easy to use from any location at any time	5.886	1.402	
• Easy to use the customer service	4.386	1.496	
• Overall PEU	5.551	1.180	
<b>Perceived Usefulness (PU)</b>			<b>.8432</b>
• Save money	5.114	1.090	
• Save time	5.733	1.187	
• Provide wide variety of products/ services	5.443	1.286	
• Overall PU	5.818	1.075	
<b>Perceived Risk with Product/Service (PRP)</b>			<b>.8107</b>
• Functional loss	4.983	1.263	
• Time loss	5.324	1.336	
• Financial loss	5.244	1.565	
• Opportunity loss	4.824	1.351	
• Overall PRP	4.796	1.055	
<b>Perceived Risk in the Context of Transaction (PRT)</b>			<b>.8746</b>
• Privacy	5.142	1.484	
• Security (Credit card)	4.296	1.818	
• Non-repudiation	4.085	1.676	
• Overall PRT	4.023	1.632	
<b>Purchase Behavior (PB)</b>			<b>.8267</b>
• Total Amount of Online Purchasing (Last 6 months)	4.528	2.119	
• Frequency of Online Purchasing (Last 6 months)	2.909	1.158	

Table 2: Cronbach's Alpha for the Scales

#### 4.4.2. Construct Validity

Implementing the dataset of 176 responses, the data was examined using principal components analysis as the extraction technique and Varimax as the method of rotation. An exploratory factor analysis conducted in this study found a 5-factor structure with 19 scales loading with eigenvalues greater than 1.0 that accounted for 70.58% of the total variance. Items intended to measure the same construct demonstrated markedly higher factor loadings ( $>.50$ ) on a single component as represented in Table 3. Consequently, the instrument of our study shows adequate validity for further analysis.

Measured Items	Factor Loading				
	PRT	PRP	PU	PEU	PB
• Easy to search/locate desired information	-.154	-.008	.282	<b>.690</b>	-.049
• Easy to use from any location at any time	.043	-.146	.397	<b>.667</b>	.150
• Easy to use the customer service	-.191	.039	.006	<b>.715</b>	.215
• Overall easy to use	-.069	-.042	.430	<b>.746</b>	.139
• Save money	-.147	.064	<b>.533</b>	.340	.439
• Save time	-.103	-.107	<b>.728</b>	.328	.107
• Provide wide variety of products/ services	-.264	-.075	<b>.739</b>	.160	.050
• Overall useful	-.178	-.046	<b>.784</b>	.361	.254
• Functional loss	.064	<b>.794</b>	-.001	.000	-.133
• Time loss	.149	<b>.800</b>	-.054	-.096	.035
• Financial loss	.340	<b>.509</b>	.251	-.147	-.262
• Opportunity loss	.239	<b>.646</b>	-.297	.196	-.128
• Overall PRP	.318	<b>.837</b>	-.090	-.075	-.167
• Privacy	<b>.763</b>	.262	.049	-.160	-.028
• Security (Credit card)	<b>.806</b>	.162	-.249	-.014	-.095
• Non-repudiation	<b>.784</b>	.215	-.243	-.109	-.188
• Overall PRT	<b>.761</b>	.209	-.257	-.170	-.250
• Electronic Purchasing Times	-.147	-.207	.179	.128	<b>.865</b>
• Electronic Purchasing Amount	-.228	-.203	.179	.162	<b>.855</b>
<b>Eigenvalue</b>	6.868	2.961	1.357	1.202	1.022
<b>Percent of Variance</b>	36.146	15.582	7.144	6.325	5.378

Table 3: Factor Analysis for Construct Validity

## 5. RESULTS

We examined our e-CAM model using structural equation modeling (SEM) technique. SEM technique not only allows researchers to analyze a set of latent constructs much like independent and dependent variables in regression analysis ((Segars et al. 1993)), but also provides researchers with a comprehensive means assessing and modifying theoretical models ((Karahanna et al. 1999)).

### 5.1. *Fitness of the e-CAM Model*

The construct validity of the model's scales was also evaluated using confirmatory factor analysis (CFA). AMOS (Analysis of MOment Structures) with maximum likelihood estimation was used to analyze the data. As there is no single recommended fit measure for the structural

equation model, a variety of measures are proposed in numerous literatures ((Chau 1997); (Segars et al. 1993)) as represented in Table 4.

Fit Measures	Recommended Values	e-CAM
Chi-square ( $\chi^2$ )	$p \geq .05$	220.22 ( $p=.00$ )
$\chi^2$ / Degree of freedom (DF)	$\leq 3.0$	<b>1.529</b>
Root mean square residual (RMR)	$\leq .05$	.220
Goodness-of-fit index (GFI)	$\geq .90$	.889
Adjusted goodness-of-fit index (AGFI)	$\geq .80$	<b>.854</b>
Normed fit index (NFI)	$\geq .90$	.889
Nonnormed fit index (NNFI)	$\geq .90$	<b>.950</b>
Comparative fit index (CFI)	$\geq .90$	<b>.958</b>
RMSEA	$\leq .05$	0.55

Table 4: Fit Measures for e-CAM

A Chi-square ( $\chi^2$ ) statistic indicates that our model does not fit the data (Chi-square = 220.22;  $p \leq .05$ ). However, as Chi-square is a direct function of sample size, in small sample size like our study, the statistic may lead to inaccurate probability value ((Chau 1997)). Instead, we assessed our model using other multiple fit criteria, such as  $\chi^2/DF$ , RMR, GFI, AGFI, NFI, NNFI, CFI, and RMSEA. The value of  $\chi^2/DF$  is around 1.529, which is below the desired cutoff value of 3.0 as recommended by several literatures ((Chau 1997); (Segars et al. 1993)). In addition, the GFI and AGFI values are .889 and .854 respectively, indicating a reasonable fit, while GFI is somewhat lower than the recommended value. Further, the NFI (.889), NNFI (.950), CFI (.958), and RMSEA (0.55) are all adequate levels. Therefore, our model is reasonably acceptable to assess the results for the SEM technique.

## 5.2. Hypotheses Testing

The results of the multivariate test of the structural model are presented in Table 5. The table shows the square multiple correlation ( $R^2$ ) as well as the path coefficients including direct and



indirect effects. The explained variance in perceived usefulness is .580. Further, the model as a whole explains .334 of the variance in e-Commerce Adoption.

	Perceived Usefulness (PU)		Purchasing Behavior (PB)		
	Direct	Total	Direct	Indirect	Total
PRT	-.237	-.237	-.285	-.117	-.402
PRP	.077	.077	-.443	.038	-.405
PEU	.613	.613	.143	.302	.445
PU			.493		.493
<b>R<sup>2</sup></b>	<b>.580</b>		<b>.334</b>		

Table 5: Direct/Indirect Effects between the Constructs

Consistent with hypotheses H-1a, PRT is negatively related to PU. The data show that PRT has strong direct effect on PU ( $\beta = -.237$ ,  $p = .000$ ). Inconsistent with hypotheses H-2b, PRP has no significant relationship with PU. The data show that PRP has little effect on PU ( $\beta = .077$ ,  $p = .337$ ). As expected in Hypotheses H-1b and H-2c, PRT and PRP both negatively affect the adoption of e-Commerce (i.e., purchasing behavior). The data show that PRT (H-1b) and PRP (H-2c) are strongly associated with the adoption (PRT:  $\beta = -.285$ ,  $p = .024$ ; PRP:  $\beta = -.443$ ,  $p = .010$ ). Further, as expected in hypothesis H-2a, PRT and PRP are highly correlated (correlation = .580,  $p = .000$ ). In accordance with TAM, PU has positive direct effects on the adoption of e-Commerce ( $\beta = .493$ ,  $p = .030$ ) while PEU is little directly related to the adoption. As represented in Table 6, PEU has strong positive effects on PU (H-3a:  $\beta = .613$ ,  $p = .000$ ), yet the direct effect of PEU on the adoption is insignificant (H-3b:  $\beta = .143$ ,  $p = .462$ ). However, it should be noted that PEU has significant indirect effect (.302) on the adoption of e-Commerce.

Hypothesis	Causal Relationship	$\beta^{1)}$	S.E. <sup>2)</sup>	C. R. <sup>3)</sup>	P <sup>4)</sup>	Result
H-1a	PRT→PU (-)	-.237	.054	-4.394	.000	Supported
H-1b	PRT→PB (-)	-.285	.126	-2.264	.024	Supported
H-2a	PRT↔PRP (+)	.580	.142	5.363	.000	Supported
H-2b	PRP→PU (-)	.077	.080	.961	.337	Rejected
H-2c	PRP→PB (-)	-.443	.175	-2.525	.010	Supported
H-3a	PEU→PU (+)	.613	.066	9.283	.000	Supported
H-3b	PEU→PB (+)	.143	.194	.736	.462	Rejected
H-4	PU→PB (+)	.493	.227	2.173	.030	Supported

<sup>1)</sup> Regression Coefficient; <sup>2)</sup> Standard Error of  $\beta$ ; <sup>3)</sup> Critical Ratio ( $= \beta / S.E.$ ); <sup>4)</sup> Statistical Significance of the Test

Table 6: Hypotheses Testing Results

### 5.3. Summary of the Results

As presented in Table 6, most of causal relationships between the constructs postulated by our model are well supported. The results suggest that PU, PRT, and PRP have significant direct effects on consumer's adoption of e-Commerce. Although direct effect of PEU ( $\beta = .143$ ) on the adoption is not significant, PEU mostly has indirect effect ( $\beta = .302$ ) on the adoption through the mediating construct (i.e., PU) as reported in Table 5. We believe that this result is mainly due to the respondent characteristics. In other words, the subjects in our study are quite knowledgeable about the Internet use, and therefore, PEU would not necessarily be a significant determining factor on consumers' purchasing behavior. Further, the insignificant direct effect of PEU is not unexpected but shows the same pattern as found in several prior TAM research ((Gefen et al. 1997); (Gefen et al. 1998); (Szajna 1996)). With regard to the impact of PRT, the result is consistent with Rose et al.'s study ((Rose et al. 1999)) as they think it as the most important impediment to B2C e-Commerce. Inconsistent with our hypotheses (H-2b), PRP has little relationship ( $\beta = .077$ ) with PU. Instead, PRP has strong direct effect ( $\beta = -.443$ ) on the adoption of e-Commerce. The result shows that consumers' PU on e-Commerce is not influenced significantly by the risk, which is derived from product/service itself. Rather, e-Commerce

consumers take into account more about the risk involved in the transactions, such as privacy, security and nonrepudiation, when they perceive e-Commerce as useful. In sum, all the determinant factors of the consumer's purchasing behavior (i.e., PEU, PU, PRT, and PRP) have significant total effects on the adoption of e-Commerce including direct/indirect effects. Figure 4 illustrates many of the significant structural relationship among the constructs in our study.

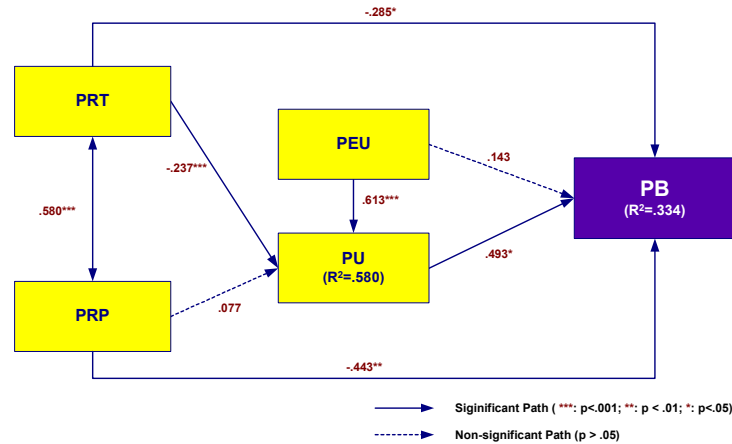


Figure 4: Result of testing the e-CAM model

## 6. DISCUSSION

In this research, most of the causal relationships between the constructs postulated by our model were well supported, accounting for .334 of the variance in PB. Therefore, the e-CAM model holds much promise for helping researcher and practitioners better understanding why consumers adopt or reject e-Commerce for a purchasing vehicle.

### 6.1. Implications

The findings of this study have significant implications in the perspective of research on e-Commerce consumer behavior. Our study provides further evidence on the appropriateness of using the TAM model to measure the different dimensions of actual usage on e-Commerce. As

expected from the previous TAM research, two specific behavioral beliefs (i.e., PEU and PU) well explain the adoption of e-Commerce. In addition, the results from our study have shown that other factors with regard to perceived risk (i.e., PRT and PRP) help us better understand the e-Commerce adoption. Therefore, in the e-Commerce setting, the power of the TAM model will be greatly enhanced by taking into account the impact of the perceived risks. In sum, our study has significant contributions to the theories of perceived risk as well as the TAM model by providing empirical evidence that PEU, PU, PRT, and PRP are important factors that influence the consumer's adoption of e-Commerce.

The findings of the study also suggest important practical implications for businesses. It is evident from this study that to convert Internet browsers into real buyers, PEU and PU must be enhanced and the PRP and PRT reduced. From the perspective of a consumer's perceived risk, the consumer is willing to purchase product/service from an online vendor that is perceived low risk, even if the consumer's PEU or PU is relatively low ((Jarvenpaa et al. 1999)). As shown in the results of our study, consumers consider the PRT (i.e., privacy, security, nonrepudiation, etc.) as one of the important factors when they purchase on the Internet. Thus, diminishing such risk is considerably important to online vendors. To lower the PRT, online vendors should establish a robust mechanism, which utilize state-of-art Internet technologies. However, as criminals will always exist in our society, if credit card is lost or stolen in a physical place, anyone can abuse the card information ((Ratnasingham 1998)). Hence, it is more important that online vendors enable consumers to place full trust on the privacy, security, integrity and availability of vendor information. Further, online vendors should build trust with consumers by giving them complete confidence on the product/service that they provide. We believe this can be achieved when online vendors improve the following service quality factors, reliability, responsiveness,

assurance, and empathy ((Kettinger et al. 1997)). In sum, online vendors should consider these contextual factors in order to facilitate consumer adoption behavior.

## **6.2. LIMITATIONS AND FUTURE RESEARCH DIRECTION**

Like any research, our study has certain limitations. First, our sampling pool was restricted to mainly academic circles, and therefore, most of the respondents were highly educated and well experienced regarding the Internet. In addition, results of the study might also be biased given the youth. Therefore, examining with more diverse Web users, such as older, less educated, and less experienced on the Internet, may enable us to construct and validate more generalized model. Second, the proposed model explains only 33.4% of the total variance of consumers' e-Commerce adoption behavior. The explanation power is relatively low, compared with previous TAM studies. This means our model might have missed some important factors to the consumer's behavior on e-Commerce. In this exploratory study, due to the sampling limitations, some factors regarding individual differences, such as gender, education, income, and Internet experience, were deliberately left out. Further, we do not include some characteristics of product/service, such as low asset specificity and ease of description (standardization), which also differentiate the products/services correctly sold over the Internet, thereby can draw consumers to purchase. Therefore, it is suggested that additional applicable factors including individual differences and product/service characteristics be identified and included in future research for better understanding of consumers' behavior and the state of e-Commerce. Finally, the measures for the construct of online purchasing behavior used in our study are self-reported; thereby the respondents may not correctly answer their experience due to their limited memory. Although self-reported measures are used in numerous studies, and the interchangeability of self-report and objective usage measures remains a controversial point in IS research ((Straub et al.

1995), (Venkatesh et al. 2000)), we believe that future research can develop more objective and accurate measures, such as an analysis of consumers' actual visit and purchase log on real e-Commerce site.

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