DECISION SCIENCES INSTITUTE
The Effect of UTAUT and IDT on Online Shopping – Familiarity and Perceived Risk as Mediators

(Full Paper Submission)

Hsin Hsin Chang
National Cheng Kung University, Taiwan
easyhhc@mail.ncku.edu.tw

Ta-Wei (Daniel) Kao
State University of New York at Buffalo, USA
taweikao@buffao.edu

Hsiou-Ting Jain
National Cheng Kung University, Taiwan

ABSTRACT
This research combines the Unified Theory of Acceptance and Use of Technology (UTAUT) with Innovation Diffusion Theory (IDT) to study customers’ online purchase intentions. Using familiarity and perceived risk as mediators, we investigate relations among performance expectancy, effort expectancy, virtual community building, trialability, and purchase intention. Our results indicate that virtual community building, trialability, performance expectancy, and effort expectancy positively influence familiarity. Compared to familiarity, which enhance purchase intention, perceived risk detrains customers’ willingness to purchase online. Lastly, following Baron and Kenny's criteria for mediation, we further examine the mediating effects of product familiarity, website familiarity, and perceived risk.

KEYWORDS: Expectancy, Trialability, Familiarity, Perceived Risk, and Purchase Intention

INTRODUCTION
Due to benefits delivered by online shopping (e.g., broader product selection; convenient home delivery; easy access to consumer reviews), more and more consumers prefer purchasing products through the Internet. However, as online shopping environment involves higher perceived risk than brick-and-mortar setting, this uncertainty would detriment customers’ willingness to purchase online (Gefen, 2000; Chen & Barnes, 2007). While Unified Theory of Acceptance and Use of Technology (UTAUT) is widely applied in previous studies to study the behavioral intention to use information systems (Venkatesh et al., 2003; Chiu and Wang; 2008; Venkatesh et al., 2008; Venkatesh et al., 2012), this theory is rarely examined in online shopping settings and does not consider the influences of perceived risk on customers’ online purchase intention.

On the other hand, with internet-based virtual reality (VR) technologies, which enable customers to experience, touch, and try out products on shopping websites, consumers become more familiar with product, increase their intentions to purchase online (Gefen, 2000; Chang, 2008; Pavlou, 2003). However, the original UTAUT again does not consider the mediation effect of familiarity on the behavioral intention. Meanwhile, as Innovation Diffusion Theory (IDT) indicates that trialability is consistently consistently associated with the adoption of innovation
(Roger, 1983; Agarwal and Prasa, 1998; Wang, 2014), previous research (e.g., Lightner and Eastman, 2002; Li et al., 2002; Wang, 2014) only enable participants to read written scenarios, view relevant video, or to rotate the angle of the product on the website, which might underestimate the effect of trialability on the customers’ online purchase intentions.

Using familiarity and perceived risk as mediators, this study adopts and tailors both the Unified Theory of Acceptance and Use of Technology (UTAUT) and Innovation Diffusion Theory (IDT) to develop a research model to investigate online shopping behavior. Additionally, by offering advanced online trials, which allow participants to try out the actual functions of the product, the genuine effect of trialability in online environment is disclosed and revealed in the current research. The purpose of this study is threefold:
(1) To combine and apply UTAUT and IDT in the online shopping environment.
(2) To examine the relations among performance expectancy, effort expectancy, virtual community building, trialability, familiarity, perceived risk, and purchase intention.
(3) To investigate mediating effects of familiarity and perceived risk on purchase intention.

THEORETICAL BACKGROUND AND RESEARCH HYPOTHESES

Research Framework

To assess customers’ intention to purchase high-tech products on a shopping website, this study used UTAUT and IDT to construct an integrated model. Three constructs of UTAUT were employed, including performance expectancy, effort expectancy, and social influence. Among these factors, social influence was replaced by virtual community building as online community is the particular channel through which consumers interact with other customers. Additionally, we also employed trialability, a characteristic of IDT, to investigate the effect of online trial on the purchase intention. While performance expectancy and effort expectancy focus on navigation and display of a shopping website, virtual community building and trialability are related to understanding attributes and functions of high-tech products.

In order to explain how these four external factors affect internal psychological intention, familiarity and perceived risk are considered as mediators in current study. While familiarity evaluate customers’ understanding and knowledge about products and websites, perceived risk measure the level of uncertainty that customer encounter in online shopping environment.

Finally, this study used intention to describe and measure whether consumers tend to purchase high-tech products on a shopping website. When consumers perceive that the website and product are familiar and that the risk involved in online shopping is eliminated, they will have higher purchase intention on the Web. The conceptual framework of this study is depicted in Figure 1.

Research Hypotheses Development

Virtual Community Building and Product Familiarity

A virtual community can be viewed as an online social entity including existing and potential customers that is organized and maintained by an e-retailer to allow consumers to communicate and learn from each other, to share information regarding offered products, to permit the sharing of norms and values and to develop continual relationships (Srinivasana et al., 2002; Raban & Rafaeli, 2007). Customers who identify with a retailer in a community can accomplish potent and long-term relationships toward community groups (Chang & Chuang, 2011). Hagel and Armstrong (1997) indicated that there are four functions that satisfy customer needs in a virtual community: sharing resources, establishing relationships, and trading and living fantasies.
According to Srinivasana et al. (2002), the current study defined virtual community building as an online social group including existing and potential customers that is organized by a seller in order to help consumers obtain and share information about a product.

According to (Gefen 2003 Komiak & Benbasat 2006), familiarity can be defined as one’s understanding or comprehension of an entity based on their previous interactions, experience, and learning of the what, who, how, and when of what is happening. Wu et al. (2008) defined product familiarity as a customer’s familiarity with a particular product category. In e-service study, Lee and Kwon (2011) website familiarity is considered as an affective factor, which refers to user’s feelings toward web-based services. Thus, we define familiarity as the customer’s understanding toward a product or a shopping website generated from their interactions with the online shopping website.

Community could foster information and knowledge sharing and offer an environment to support customers, and then increase customer’s trust in a website (Bart et al., 2005). Thus, a shopping website that has built a community makes customers obtain more knowledge related to the products offered on the site. According to Cowley and Mitchell (2003), consumers who have more knowledge can not only select and examine information but also have a greater understanding of the characteristics, which will result in an optimal choice. By gathering more useful product information from online community, consumers will be more familiar with the products. Therefore, the following hypothesis can be formulated:

**H1: Virtual community building has a positive effect on product familiarity.**

**Virtual Community Building and Perceived Risk**

In e-commerce, perceived risk refers to financial, product performance, social, psychological, physical and time risks when customers make transactions online (e.g., online payment; transmission of personal information) (Chang & Chen, 2008). When customers make non-store purchasing decision in the internet, they tend to receive higher risk and bear the risk of having their personal data compromised (Dollin et al., 2005; Chang & Chen, 2009). Hence, lack of perceived security or high perceived risk becomes a major reason why many potential consumers do not shop or purchase online (Chang & Chen, 2009). Accordingly, we define perceived risk as customer’s perceptions of security and expectations of negative outcomes in online transactions.

A virtual community provides a platform for communication and also enables e-retailers to understand customer preferences. Through such platforms, consumers’ need no longer wait for a slow or inconsistent response from their e-retailers (Tsai & Huang, 2007; Chang & Chen, 2009). Due to the interaction in the community, consumers will have better understanding and know well about what kind of product they want to buy, so they can reduce the risk related to purchasing an unfamiliar product. Additionally, through sharing interests and expertise with like-minded consumers within a community, consumers will feel comfortable and secure (Tsai & Huang, 2007).

Therefore, if there is a community on a shopping website, consumers can become more familiar with the value and quality of products and will as a result feel more secure about purchasing because of discussion with other consumers. Consumers can also decrease the perceived risk related to products and privacy. Thus, this study presents the following hypothesis:

**H2: Virtual community building has a negative effect on perceived risk.**
Performance Expectancy, Website Familiarity, and Perceived Risk

In UTAUT, Venkatesh et al. (2003) defined performance expectancy as the degree to which an individual believes that using a particular system will help him or her to accomplish tasks with good performance. The five constructs from the existing models that are related to performance expectancy include perceived usefulness (TAM/TAM2; combined TAM and TPB), extrinsic motivation (Motivational Model), job-fit (Model of PC Utilization), relative advantage (IDT), and outcome expectations (SCT).

As website is an information system that can offer relevant information to users, a good website avoids wasting customer time by providing orderly screens, simple search paths, fast and readable presentations, and simple navigation; these, in turn, reduce customer switching behavior (Chang & Chen, 2009). Hence, customers can conduct online shopping only if the shopping website effectively helps them to accomplish online transactions. The interactive nature of websites has been credited with positively affecting consumer response, including a desire to return to the website. To conform to reality in online shopping environment, we define performance expectancy as the degree to which customers consider that using the shopping website can help them to achieve the goal of purchasing a product.

Compeau and Higgins (1995) indicated that outcome expectations have a significant effect on an individual’s reaction to computing technology. Additionally, Interactivity is regarded as the main element of website usability (Palmer, 2002; Chen et al., 2007). Berthon et al. (1996) demonstrated that in the case of Internet interaction, the level of machine interaction is based on how users react to the content. Therefore, if the shopping website performs well, consumers will develop more positive feeling and reaction toward the website, and will be more willing to interact with it. Through interaction, consumers will understand how the website operates and will be more familiar with its content. According to the above discussion, consumers will become familiar with a particular shopping website if the website performs well.

Rani et al. (2007) viewed users’ anxiety as an important element in human-machine interaction; moreover, the levels of purchase uncertainties were felt to be influenced by the form of the shopping interface (Wood, 2001). When a shopping website offers more useful and explicit information, consumers have less anxiety and react more positively toward the shopping website. Mach et al. (2010) and Rhee et al. (2006) argued that human-computer interaction will facilitate user learning, thus reducing the number of user errors. Therefore, by means of interaction between websites and consumers, consumers can feel that a website is credible and that the risk associated with purchasing on the Web will be reduced. Hence, this study proposes:

**H3:** Performance expectancy has a positive effect on website familiarity.
**H4:** Performance expectancy has a negative effect on perceived risk.

Effort Expectancy and Website Familiarity

According to Chiu and Wang (2008), effort expectancy refers to ease of use in Technology Acceptance Model (TAM), which argues that a system perceived to be easy to use is more likely to enhance customers’ behavioral intention. When customers shop on websites, they usually have limited time and thus may seek to save time and attain the convenience of shopping online (King et al., 2004). Hence, a website that is easy to navigate can enable users to satisfactorily accomplish their aims associated with a particular context of a website (Agarwal & Venkatesh, 2002). In UTAUT, effort expectancy is defined as the degree of ease related to the use of a particular system (Venkatesh et al., 2012). To fit online shopping situations, the definition of effort expectancy in this study is the degree of ease associated with using a shopping website to
purchase a product.

Previous studies suggested that consumers have greater participation and develop a perception of trust in a provider when the website has the expected functions and is easy to use (Teo et al., 2003; Chau et al., 2007). On the other hand, McKinney et al. (2002) also stated that a website will be abandoned if customers experience difficulty when searching or attempting to recall information they need, even if the website offers the essential information that can accomplish the intended task. Therefore, if consumers use the online shopping website without effort, they have a better understanding of what is offered on the site and become more familiar with online vendors. These arguments and justifications lead to the following hypothesis given by:

\[ H5: \text{Effort expectancy has a positive effect on website familiarity.} \]

Effort Expectancy and Perceived Risk

When consumers want to purchase through online vendors, they must learn how to use the websites. Hence, if the website is difficult to use, consumers cannot completely understand the online purchase procedures and will increase their perceived uncertainty and risk in online shopping. In mobile-service, Wang et al., (2006) have argued that users will feel secure and protected if the provider places more effort in configuring the system, which allows them to browse and navigate without effort. Additionally, Chang (2008) also indicated that easy-to-use information system will lower user’s perceived risk. Accordingly, we can hypothesize that:

\[ H6: \text{Effort expectancy has a negative effect on perceived risk.} \]

Trialability and Product Familiarity

Rogers (1983) defined trialability as the degree to which a person can experiment with an innovation on a limited basis before adopting or rejecting. Though a product is not actually tried, the knowledge that it could be transmits a quality signal to the consumer like a guarantee (Gallaughger & Wang, 2002). As Internet is viewed as an interactive and multimedia-rich technology with low costs related to communication (Dahan & Hauser, 2002; Urban & Hauser, 2004), it permits customers to virtually try new products and provides new interaction between sellers and consumers (Fuller & Matzler, 2007). According to Jiang and Benbasat (2007), customers can gain a deeper perception of what products are like if shopping websites permit them to interact with and try product functions on the web interface. Based on the above discussion, trialability of products is viewed as an important factor when consumers are evaluating products and services. Therefore, this study defined trialability as the degree to which customers can experiment or try out the functions of the product before purchasing on the website.

Bart and Smith (1998) suggested that customers become more familiar with the product during the product trial. Hence, through a VR interface, consumers will be more interested in learning to understand the information and the functions of products. The interactivity resulting from sensory-enabling technologies can increase the hedonic value of online shopping and bring users vivid mental images of products (Schlosser, 2003; Kim & Forsythe, 2008). Moreover, offering product trails has been shown to be useful in building strong brand equity with customers who are unfamiliar with a specific product (Keller, 1993). These arguments and justifications lead to the following hypotheses given by:

\[ H7: \text{Trialability has a positive effect on product familiarity.} \]
Trialability and Perceived Risk

By trying and interacting using the functions of virtual products on the Web, consumers can virtually learn how unfamiliar or unknown products function, and identify the benefit of products before they are adopted. This perception helps them forecast product performance or creates further inferences as a result of their being able to comprehend product features and construct a mental representation of the products they are considering purchasing (Jiang & Benbasat, 2007). Moreover, if a service brand is highly trialable, customers will try the brand readily and the costs of evaluation are lower (Hauser & Wernerfelt, 1990).

According to the above statements, through trial, consumers can gain and build more knowledge of products, and then the risk resulting from online shopping will be reduced. Therefore, Hypothesis 8 is proposed as:

**H8:** Trialability has a negative effect on perceived risk.

Familiarity and Perceived Risk

Kim et al. (2008) argue that familiarity with an online vendor would reduce perceived risk through an understanding of how to search and purchase items on the site. Moreover, familiarity can also evoke more positive feelings (emotional appeal) towards a website (Corritore et al., 2003). As a result, customers who are more familiar with a website may feel less anxiety and will have pleasant usage experience, which enhances their perceived quality of the website (McCoy et al., 2009). On the contrary, customers are not willing to have contact with unfamiliar or unknown vendors because they are afraid that their credit cards will be misused and that they will suffer a loss of privacy (Lim, 2003). Based on the above suggested definitions and relationships in the literature, we hypothesize that:

**H9:** (a) Website familiarity, (b) product familiarity has a negative effect on perceived risk.

Familiarity and Purchase Intention

Chang and Chuang (2011) and Pavlou and Fygenson (2006) indicated that customer’s purchase intention is a significant predictor of actual participation in online transactions. Pavlou (2003) suggested that an online transaction is comprised of three important steps: information retrieval, information transfer, and product purchase. While the first two steps are related to intention to use the website, product purchase is more relevant to the intention to transact with online vendors. Based on the above discussion, the definition of purchase intention in this study is the probability and willingness to purchase products on a shopping website.

Previous researches have indicated that familiarity can reduce perceived complexity, which in turn increased intention to use and purchase from a vendor (Gefen, 2000; Nadkami & Gupta, 2007). Additionally, familiarity can also provide a structure for future expectations and can help customers accumulate trust-relevant knowledge about the trustee, so it can build trust in consumers (Doney & Cannon, 1997; Gulati, 1995). Due to a reduction in complexity and a creation of trust, most studies have suggested that consumers are more likely to purchase products with well-known brands online and are more likely to shop from well-known e-retailers (Lee & Tan, 2003; Riley et al., 2009). Therefore, the following hypothesis is proposed:

**H10:** (a) Website familiarity, (b) product familiarity has a positive effect on purchase intention.
Perceived Risk and Purchase Intention

While customer perceptions of security formed through interaction with an e-commerce website affected customer satisfaction and switching costs, and thus customer purchase intention (Chang & Chen, 2009), the perceived risk of online transactions may negatively influence transaction intentions (Kim & Forsythe, 2008; Chang & Chen, 2009). In addition, Kim et al. (2008) also indicated that perceived risk becomes an important barrier for online customers to make a decision of an online purchase because the perceived risk may be more overwhelming in the online shopping environment. According to the above reasons, we formulate the following hypothesis:

H11: Perceived risk has a negative effect on purchase intention.

RESEARCH DESIGN AND METHODOLOGY

Questionnaire Design

To test the effect of a virtual community on the intention to purchase, we first search and select online shopping websites that provide virtual communities. According to data from InsightXplorer, a marketing research firm in Taiwan, we identify that only Momo and Etmall have established their user communities. Hence, this study chooses Momo and Etmall to design online shopping scenarios in our questionnaire.

There are three parts in the survey. Section 1 is related to the online shopping experience and includes two items. In Section 2, the participants were asked to read the scenarios related to shopping motivation: Imagine that you want to purchase a cell phone, but there are few offline stores from which to select and these stores provide few types of products. So, due to a friend's recommendation, you decide to browse the cell phones offered in the online shopping stores, Momo (Etmall), and to search for information about cell phones in their virtual community.

Next, each participant was asked to fill out thirty-six items related to the feelings related to searching and browsing. Before filling out the items related to trialability, the respondents were asked to use a virtual technology that enables them to try the functions of the cell phones (see Figure 2).

Sample Characteristics

After the pilot test, items EE6, VCB6, and PI1 43 were deleted due to their low Item-to-total values. The formal questionnaire is launched on the Bulletin Board System (BBS), and respondents were randomly assigned to visit one of the two websites (Momo or Etmall). Following the description of the purchasing situation in the survey, respondents were asked to browse products and virtual community, and try the cell phone online (see Figure 2). A total of 344 valid responses are used for further analysis.

Among these respondents, 41.57% of respondents were male, and 58.43% were female. 11.34% of the respondents were under 20 years of age; 58.43% were between 21 and 25; 22.09% were between 26 and 30; 3.78% were between 31 and 35; 2.26% were between 36 and 40; 1.74% were over 40. 2.26% of respondents had senior high school diplomas; 69.19% had college degrees; 28.2% had graduate degrees.
Figure 1 Conceptual Framework

Unified Theory of Acceptance and Use of Technology (UTAUT)
- Virtual Community Building
- Website Performance Expectancy
- Effort Expectancy
- Trialability

Innovation Diffusion Theory (IDT)

Familiarity
- Product Familiarity
- Website Familiarity

Perceived Risk

Purchase Intention

H1, H2, H3, H4, H5, H6, H7, H8, H9a,b, H10a,b, H11
RESULT OF DATA ANALYSIS

Confirmatory Factor Analysis (CFA), Validity, Reliability, and Discriminant analysis

This study used SPSS and AMOS to analyze the data. CFA is a measurement model that can transfer the observed, recorded, or measured variables to the latent variables (constructs) and investigate whether or not collected data can represent what the study really desires to measure.

The chi-square value was significant ($p < 0.001$), and $\chi^2/df = 1.896$ was lower than the recommended value. The goodness of fit index (GFI) =0.874, comparative fit index (CFI) =0.959, adjusted goodness of fit index (AGFI)=0.844, and normed fit index (NFI) =0.917 were higher than the recommended value. The root mean square error of approximation (RMSEA) =0.051 was lower than the recommended value.
The results of item-to-total, factor loading, t-value, and composite reliability (CR) are shown in Table 1. In effort expectancy and perceived risk, the factor loading values for EE5 (Searching cell phones in ETMall is so complicated, it is difficult to understand what is going on.), PR4 (My friends and relatives would think that I am unwise.), PR5 (I would be concerned that I will have to wait too long for the delivery of the cell phones.), and PR7 (It would lead to a loss of privacy because of the improper use of my personal information.) were below 0.5, so these items were eliminated. AVE values of all constructs are shown to be above 0.5, ranging from 0.580 (Perceived Risk) to 0.772 (Performance Expectancy).

This study assessed discriminant validity by calculating the AVE of each construct and comparing the AVE to the square of the correlation between any two constructs. The square of correlation between any two constructs should be lower than the AVE value for each construct. The result of discriminant validity analysis is shown in Table 2, and AVE values of all constructs in the diagonal are shown to be higher than the square of the correlation between any two constructs.

Table 1 Confirmatory Factor Analysis (n=344)

<table>
<thead>
<tr>
<th>Observed Variables</th>
<th>Item to Total</th>
<th>Factor Loading</th>
<th>t-Value</th>
<th>CR</th>
<th>AVE</th>
<th>α</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Performance Expectancy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PE1: Using the ETMall/Momo improves my performance in my searching and purchasing cell phones.</td>
<td>0.830</td>
<td>0.870***</td>
<td>23.466</td>
<td>0.944</td>
<td>0.772</td>
<td>0.949</td>
</tr>
<tr>
<td>PE2: Using the ETMall/Momo enhances my effectiveness on searching and purchasing cell phones.</td>
<td>0.882</td>
<td>0.889***</td>
<td>24.665</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PE3: Using ETMall/Momo enables me to accomplish searching and purchasing cell phones more quickly.</td>
<td>0.863</td>
<td>0.855***</td>
<td>25.625</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PE4: Using ETMall/Momo makes it easier to do searching and purchasing cell phones.</td>
<td>0.874</td>
<td>0.897</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PE5: Considering all tasks, the general extent to which use of ETMall/Momo could assist on searching and purchasing cell phones.</td>
<td>0.845</td>
<td>0.882***</td>
<td>24.299</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Effort Expectancy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE1: It is easy for me to become skillful at using the ETMall/Momo to search cell phones.</td>
<td>0.809</td>
<td>0.837***</td>
<td>21.597</td>
<td>0.924</td>
<td>0.752</td>
<td>0.924</td>
</tr>
<tr>
<td>EE2: My interaction to search cell phones with the ETMall/Momo is clear and understandable.</td>
<td>0.842</td>
<td>0.875***</td>
<td>23.861</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE3: I find it easy to search cell phones in ETMall/Momo.</td>
<td>0.838</td>
<td>0.900</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EE4: Learning to search cell phones in ETMall/Momo would be easy for me.</td>
<td>0.809</td>
<td>0.857***</td>
<td>22.684</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Virtual Community Building</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCB1: ETMall/Momo provides a complete community for customer-to-customer/company communications about cell phones.</td>
<td>0.736</td>
<td>0.808***</td>
<td>17.691</td>
<td>0.902</td>
<td>0.646</td>
<td>0.912</td>
</tr>
<tr>
<td>VCB2: I have a sense of belonging toward other shoppers and ETMall/Momo.</td>
<td>0.765</td>
<td>0.764***</td>
<td>16.226</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VC Bahasa Indonesia (VCB)</td>
<td>Value 1</td>
<td>Value 2</td>
<td>Value 3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------------------------------------------------------------------------------------------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCB3: I am interested in a community for ETMall/Momo shoppers and the service provider.</td>
<td>0.756</td>
<td>0.758***</td>
<td>16.113</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCB4: Customers can share experiences about cell phones from the community in ETMall/Momo with other customers who also purchase in ETMall/Momo.</td>
<td>0.800</td>
<td>0.838***</td>
<td>23.507</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VCB5: It is easy to interact with other users of the community in ETMall/Momo who may buy cell phones at ETMall/Momo before or who use ETMall/Momo frequently.</td>
<td>0.822</td>
<td>0.863</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trialability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRI1: During the Internet-based virtual reality technologies, I could try out various functions of this cell phone.</td>
<td>0.815</td>
<td>0.859***</td>
<td>21.609</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRI2: This cell phone was available to me to adequately test run various functions of the cell phone.</td>
<td>0.827</td>
<td>0.873***</td>
<td>22.269</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRI3: Before deciding whether to purchase this cell phone, I was able to properly try it out.</td>
<td>0.832</td>
<td>0.876</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRI4: Being able to try out cell phones was important in my deciding whether or not to buy it.</td>
<td>0.817</td>
<td>0.821***</td>
<td>19.704</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TRI5: I would be permitted to use cell phones on a trial basis long enough to see what it can do.</td>
<td>0.846</td>
<td>0.849***</td>
<td>21.035</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Website Familiarity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WF1: I am familiar with searching for cell phone in ETMall/Momo through visiting ETMall/Momo and searching for cell phone.</td>
<td>0.810</td>
<td>0.891***</td>
<td>23.016</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WF2: I am familiar with the processes of purchasing cell phone in ETMall/Momo through visiting ETMall/Momo and searching for cell phone.</td>
<td>0.832</td>
<td>0.906</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WF3: I am familiar with the ETMall/Momo through visiting ETMall/Momo and searching for cell phone.</td>
<td>0.708</td>
<td>0.769***</td>
<td>17.899</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Product Familiarity</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PF1: I consider myself familiar with cell phone through visiting ETMall/Momo and searching for cell phone.</td>
<td>0.774</td>
<td>0.878</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PF2: I think I am well informed about cell phone through visiting ETMall/Momo and searching for cell phone.</td>
<td>0.782</td>
<td>0.840***</td>
<td>19.511</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PF3: My knowledge of the cell phone served by ETMall/Momo is complete.</td>
<td>0.736</td>
<td>0.800***</td>
<td>18.110</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Perceived Risk</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PR1: I would be concerned that I really would not get my money's worth from the cell phones.</td>
<td>0.701</td>
<td>0.797***</td>
<td>16.438</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PR2: I would find it very difficult to evaluate the characteristics of the cell phones accurately.</td>
<td>0.668</td>
<td>0.761***</td>
<td>15.532</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Chang et al.  

Effect of UTAUT and IDT on Online Shopping

PR3: There would be many possibilities that the cell phones would not perform as it is supposed to.  

PR6: It would give me a feeling of anxiety.  

Purchase Intention  

PI1: It is likely that I will transact with ETMall/Momo in the near future  

PI2: Given the chance, I intend to use this ETMall/Momo to purchase cell phones.  

PI3: I consider this ETMall/Momo as my choice for online purchasing cell phones.  

Purchase Intention  

PI1: It is likely that I will transact with ETMall/Momo in the near future  

PI2: Given the chance, I intend to use this ETMall/Momo to purchase cell phones.  

PI3: I consider this ETMall/Momo as my choice for online purchasing cell phones.  

*p < .05; ** p < .01; *** p < .001  

Note:  
1. Cronbach’s α is the most widely used index for assessing reliability, α > 0.7.  
2. Composite reliability (CR) is a measure of the internal consistency of the construct indicators, CR > 0.7.  
3. Average variance extracted (AVE) > 0.5.

Table 2 Result of Discriminant Validity Analysis

<table>
<thead>
<tr>
<th>Construct</th>
<th>Inter-Construct Squares of Correlations</th>
<th>*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Expectancy (PE)</td>
<td>0.7722</td>
<td>WPE</td>
</tr>
<tr>
<td>Effort Expectancy (EE)</td>
<td>0.6068</td>
<td>WEE</td>
</tr>
<tr>
<td>Virtual Community Building (VCB)</td>
<td>0.5271 0.3795 0.6455</td>
<td>VCB</td>
</tr>
<tr>
<td>Trialability (TRI)</td>
<td>0.3147</td>
<td>TRI</td>
</tr>
<tr>
<td>Website Familiarity (WF)</td>
<td>0.3376</td>
<td>WF</td>
</tr>
<tr>
<td>Product Familiarity (PF)</td>
<td>0.4147</td>
<td>PF</td>
</tr>
<tr>
<td>Perceived Risk (PR)</td>
<td>0.0001</td>
<td>PR</td>
</tr>
<tr>
<td>Purchase Intention (PI)</td>
<td>0.1998</td>
<td>ITP</td>
</tr>
</tbody>
</table>

*aDiagonal elements (in italics) represent the AVE for that construct

Structural Model Analysis (SEM)

Based on the overall model fit analysis, the proposed model was a good representation of the structures underlying the observed data (χ²/df = 2.078; the goodness of fit index = 0.863; the comparative fit index = 0.950; the adjusted goodness of fit index = 0.833; normed fit index = 0.908; the root mean square error of approximation = 0.056). The results of the SEM are shown in Figure 3.

Virtual community building was shown to positively affect product familiarity (γ = 0.553, p < 0.001), but had no significant effect on perceived risk (γ = -0.184, p = 0.156), so H1 is supported, and H2 is not supported. Hypothesis 3 and 4 proposed that performance expectancy positively affects website familiarity and negatively affects perceived risk, and the results indicated that performance expectancy has a significantly positive effect on website familiarity (γ = 0.153, p < 0.05), but no significantly positive effect on perceived risk (γ = -0.048, p = 0.692), so H3 is supported and H4 are not supported.

Hypothesis 5 and 6 proposed that effort expectancy positively affects website familiarity and negatively affects perceived risk, and the results indicated that effort expectancy has a significantly positive effect on website familiarity (γ = 0.601, p < 0.001), but no significantly positive effect on perceived risk (γ = 0.078, p = 0.526), so H5 is supported and H6 are not supported.
Hypothesis 7 and 8 proposed that trialability positively affects product familiarity and negatively affects perceived risk, and the results indicated that trialability has a significantly positive effect on product familiarity ($\gamma=0.347$, $p<0.001$), but no significantly positive effect on perceived risk ($\gamma=0.067$, $p=0.470$), so H7 is supported and H8 are not supported.

Hypothesis 9a and 9b proposed that website familiarity and product familiarity would negatively affect perceived risk, and the results indicated that website familiarity ($\beta=-0.020$, $p=0.818$) and product familiarity ($\beta=0.115$, $p=0.354$) have no significant effect on perceived risk, so H9a and H9b are not supported.

Hypothesis 10a, 10b and 11 proposed that website familiarity and product familiarity would positively affect intention to purchase and that perceived risk would negatively affect purchase intention, and the results indicated that website familiarity ($\beta=0.197$, $p<0.01$) and product familiarity ($\beta=0.558$, $p<0.001$) have a significant positive effect on purchase intention; moreover, perceived risk ($\beta=-0.310$, $p<0.001$) has a significant negative effect on purchase intention, so H10a, H10b and H11 are supported. The results of the structural equation modeling are shown in Table 3.

<table>
<thead>
<tr>
<th>Path</th>
<th>Standardized Coefficient</th>
<th>CR Value</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>H1: Virtual Community Building→ Product Familiarity</td>
<td>0.553</td>
<td>10.230***</td>
<td>Support</td>
</tr>
<tr>
<td>H2: Virtual Community Building→ Perceived Risk</td>
<td>-0.184</td>
<td>-1.419</td>
<td>Not Support</td>
</tr>
<tr>
<td>H3: Performance Expectancy→ Website Familiarity</td>
<td>0.153</td>
<td>1.990*</td>
<td>Support</td>
</tr>
<tr>
<td>H4: Performance Expectancy→ Perceived Risk</td>
<td>-0.048</td>
<td>-0.396</td>
<td>Not Support</td>
</tr>
<tr>
<td>H5: Effort Expectancy→ Website Familiarity</td>
<td>0.601</td>
<td>7.353***</td>
<td>Support</td>
</tr>
<tr>
<td>H6: Effort Expectancy→ Perceived Risk</td>
<td>0.078</td>
<td>0.635</td>
<td>Not Support</td>
</tr>
<tr>
<td>H7: Trialability→ Product Familiarity</td>
<td>0.347</td>
<td>7.412***</td>
<td>Support</td>
</tr>
<tr>
<td>H8: Trialability→ Perceived Risk</td>
<td>0.067</td>
<td>0.723</td>
<td>Not Support</td>
</tr>
<tr>
<td>H9a: Website Familiarity→ Perceived Risk</td>
<td>-0.020</td>
<td>-0.230</td>
<td>Not Support</td>
</tr>
<tr>
<td>H9b: Product Familiarity→ Perceived Risk</td>
<td>0.115</td>
<td>0.927</td>
<td>Not Support</td>
</tr>
<tr>
<td>H10a: Website Familiarity→ Purchase Intention</td>
<td>0.197</td>
<td>2.948**</td>
<td>Support</td>
</tr>
<tr>
<td>H10b: Product Familiarity→ Purchase Intention</td>
<td>0.558</td>
<td>7.179***</td>
<td>Support</td>
</tr>
<tr>
<td>H11: Perceived Risk→ Purchase Intention</td>
<td>-0.310</td>
<td>-4.842***</td>
<td>Support</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01; ***p < .001

The Mediating Effect: Product Familiarity, Website Familiarity, and Perceived Risk

In addition to SEM, the current research also adopts Baron and Kenny’s regression approach to examine the mediating effects of product familiarity, website familiarity, and perceived risk in a rigorous manner. According to Baron and Kenny (1986) and Zhao et al. (2010), the relations between independent variable X, dependent variable Y, and mediating variable M can be expressed in figure 4:
The following conditions should be fulfilled to establish mediation: (1) the independent variable $X$ has a significant influence on the dependent variable (equation 1), (2) $X$ significantly affects the mediator $M$ (equation 2), (3) $M$ reveals a significant impact on $Y$ (equation 3), and (4) the effect of the $X$ on the $Y$ must diminish after controlling for the effects of the mediator. If any of these conditions are not satisfied, no mediation effect exists (Baron & Kenny, 1986; Sarkis et al., 2010).

$$Y = \beta_{i0} + \beta_{11}X + e_1$$  \hspace{1cm} (1)

$$M = \beta_{20} + \beta_{21}X + e_2$$  \hspace{1cm} (2)

$$Y = \beta_{30} + \beta_{31}M + e_3$$  \hspace{1cm} (3)

$$Y = \beta_{40} + \beta_{41}X + \beta_{42}M + e_4$$  \hspace{1cm} (4)

Additionally, as shown in equation 5, Baron and Kenny (1986) also recommend the Sobel z-test for the indirect path $\beta_{11}$ and $\beta_{32}$ (Sobel, 1982; Zhao et al., 2010):

$$z = \frac{\beta_{11} \times \beta_{32}}{\sqrt{(\beta_{32})^2 S_{\beta_{32}}^2 + (\beta_{11})^2 S_{\beta_{11}}^2}}$$  \hspace{1cm} (5)

Hence, we first examine the mediating effects of product familiarity. As indicated in Table 4, virtual community building and trialability significantly influence product familiarity. Additionally, step 1 in Table 5 shows that virtual community building and trialability have significant effects on purchase intention. In step 3, when product familiarity is included in the equation, the coefficient of virtual community building is significantly reduced from 0.397 to 0.322, and the z-value provided by the Sobel test was calculated to be 7.03, $p$-value < 0.000. Therefore, product familiarity mediates virtual community building and purchase intention. Moreover, when product familiarity is included in the equation, the coefficient of trialability is significantly reduced from 0.192 to 0.137. The z-value provided by the Sobel test was also calculated to be 6.07, with a $p$-
value $< 0.000$. Hence, the mediating effect of product familiarity on the relationships between trialability and purchase intention is supported.

Moving on to website familiarity, we find that performance expectancy and effort expectancy significantly influence website familiarity (Table 4). Furthermore, step 1 in Table 5 reveals that performance expectancy and effort expectancy have significant impacts on purchase intention. In step 3, after website familiarity is considered in the equation, the coefficient of performance expectancy is significantly dropped from 0.294 to 0.265. The significant z-value ($z = 2.51$; $p$-value $< 0.000$) offered by the Sobel test support that website familiarity mediates performance expectancy and purchase intention. Similarly, when website familiarity is included in the equation, the effect of effort expectancy becomes insignificant. The z-value provided by the Sobel test was also calculated to be 5.65, with a $p$-value $< 0.000$. Therefore, the mediating effect of website familiarity on the relations between trialability and purchase intention is confirmed.

Additionally, since the data in this study is ordinal data, an Ordered Probit Regression also was employed to analyze the mediation effect of familiarity. Comparing Ordinary Least Squares (OLS) with the Ordered Probit Regression, we attain the same conclusion.

However, as performance expectancy, effort expectancy, virtual community building and trialability all have no significant effects on perceived risk (Table 4), perceived risk has no mediation effects between these four antecedents and purchase intention. The same result is obtained after we compare the results from OLS with the Ordered Probit Regression.

### Table 4 Effect of Independent Variable on Dependent Variable

<table>
<thead>
<tr>
<th>(1) Independent Variable</th>
<th>Dependent Variable: <strong>Product Familiarity</strong></th>
<th>(2) Independent Variable</th>
<th>Dependent Variable: <strong>Website Familiarity</strong></th>
<th>(3) Independent Variable</th>
<th>Dependent Variable: <strong>Perceived Risk</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Community Building</td>
<td>0.485*** (11.508)</td>
<td>Performance Expectancy</td>
<td>0.161** (2.694)</td>
<td>Performance Expectancy</td>
<td>-0.053 (-0.592)</td>
</tr>
<tr>
<td>Trialability</td>
<td>0.349*** (8.266)</td>
<td>Effort Expectancy</td>
<td>0.527*** (8.810)</td>
<td>Effort Expectancy</td>
<td>0.073 (0.875)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Virtual Comm. Building</td>
<td>-0.101 (-1.400)</td>
<td>Trialability</td>
<td>0.069 (1.044)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adjust $R^2$</td>
<td>0.495</td>
<td>Adjust $R^2$</td>
<td>0.495</td>
</tr>
<tr>
<td>$F$</td>
<td>169.237***</td>
<td>$F$</td>
<td>127.152***</td>
<td>$F$</td>
<td>1.055</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.498</td>
<td>$R^2$</td>
<td>0.427</td>
<td>$R^2$</td>
<td>0.012</td>
</tr>
<tr>
<td>Adjust $R^2$</td>
<td>0.495</td>
<td>Adjust $R^2$</td>
<td>0.424</td>
<td>Adjust $R^2$</td>
<td>0.001</td>
</tr>
</tbody>
</table>

* $p < .05$; ** $p < .01$; *** $p < .001$; the value in parenthesis represent the t-value.
Table 5 Regression of Mediating Effect: (1) Product Familiarity, (2) Website Familiarity

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Standardized Regression Coefficient</th>
<th>Dependent Variable: Purchase Intention</th>
<th>(1) Step 1</th>
<th>Step2</th>
<th>Step 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Comm. Building</td>
<td>0.397***</td>
<td>(7.737)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trialability</td>
<td>0.192***</td>
<td>(3.733)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Product Familiarity</td>
<td>0.434*</td>
<td>(8.901)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance Expectancy</td>
<td>0.294***</td>
<td>(4.131)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effort Expectancy</td>
<td>0.167*</td>
<td>(2.344)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Website Familiarity</td>
<td>0.372**</td>
<td>(7.413)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>59.148**</td>
<td>79.221</td>
<td>41.842***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.258</td>
<td>0.188</td>
<td>0.270</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjust R²</td>
<td>0.253</td>
<td>0.186</td>
<td>0.263</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dependent Variable: Purchase Intention</th>
<th>(2) Step 1</th>
<th>Step2</th>
<th>Step 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance Expectancy</td>
<td>0.265***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Effort Expectancy</td>
<td>0.071</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Website Familiarity</td>
<td>0.182**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>39.026*</td>
<td>54.949*</td>
<td>29.251**</td>
</tr>
<tr>
<td>R²</td>
<td>0.186</td>
<td>0.138</td>
<td>0.205</td>
</tr>
<tr>
<td>Adjust R²</td>
<td>0.181</td>
<td>0.136</td>
<td>0.198</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01; ***p < .001; the value in parenthesis represent the t-value

MANAGERIAL IMPLICATIONS AND CONCLUDING REMARKS

Managerial Implications

This study proposes a research model based on UTAUT and IDT to investigate the intention to purchase a high-tech product in online stores. Using Baron and Kenny’s (1986) criteria for mediation, we further examine mediating effects of familiarity and perceived risk upon the relationships among performance expectancy, effort expectancy, virtual community, trialability, and purchase intention. Moreover, by designing and providing advanced online trials, which allow our respondents to try out product, we further unveil the genuine impact of trialability on the online shopping environment. The major findings and managerial implications are summarized and stated as follows.

First, our results indicate that the virtual community building and trialability have positive effects on product familiarity, which in turn influence customers’ purchase intentions. This evidence points out that online retailers should pay more attention to online communities building so that consumers can better understand the attributes of a product through sharing information and communicating with other customers. Meanwhile, for more complex and technical products, such as computers or cell phones, online retailers should provide consumers with access to try functions of the product in order to increase their understanding of the product and to make sure whether or not the product matches their expectations. As a result, consumers will further increase their online purchase intentions.

Second, relationships between performance expectancy, effort expectancy, website familiarity, and purchase intention are also supported and confirmed by our data, which implies that customers’ evaluation of system performance and usability will determine their frequency of using a website, which will enhance their understanding toward online vendor. As customers become more familiar toward the shopping website, they are more likely to place an order through vendor's system.
Third, while perceived risk negatively influences purchase intention, performance expectancy, effort expectancy, virtual community building, trialability, and familiarity do not significantly affect perceived risk. The possible explanation might lie in the fact that while customer become more familiar with online vendor’s product through interacting with virtual community user and online trail, higher perceive risk might still exist and is generated from characteristics of high-tech products (e.g., short product life-cycle; rapid obsolescence) and respondents’ lack of experience of purchasing cell phones online. Hence, online vendors should provide more information about their products and websites and more protection related to personal privacy and equity, so that consumers can reduce perceived risk associated with the process of purchasing in online stores and in turn promote intention of online shopping.

Lastly, using both SEM and the Baron and Kenny’s (1986) test, we examine the mediating effects of familiarity and perceived risk in a rigorous manner. Our results find that familiarity reveals significant mediation effect on the relationships among performance expectancy, effort expectancy, virtual community building, trialability, and purchase intention, which suggests that it might be insufficient to assume simple direct relationships among these factors. By introducing familiarity as mediation variable, we fill the missing link between these four determinants and purchase intention in online shopping environment and manager could observe the mechanism of how these external factors affect internal psychological variable.

Limitations and Directions for Future Research

Two limitations are identified in this study. First, the collected data were mostly from students, accounting for 56.4%, and the age of respondents was mostly below twenty-five, accounting for 69.77%. Thus, this sample may not completely represent the Internet user population, and there are questions related to generalization. Future research should equalize the distribution of the sample demographics, such as age, occupation and education, in order to study this model.

Second, because this study aimed to select shopping websites which have their own virtual community, this study only used two website, Etmall and Momo, as website stimuli. However, high-tech products are not the main products on these two websites, so consumer intention related to purchasing high-tech products in online stores may have been affected. Therefore, future research can select a shopping website in which consumers often purchase high-tech products as website stimuli to avoid the influence of attributes of websites on consumers’ purchase intention.

Third, this study does not consider the needs or experiences of consumers in the research model, so facilitating conditions, based on the construct of UTAUT, were excluded in this study. However, according to the research from Agarwal and Prasa (1998), three constructs of IDT, including relative advantage, complexity and compatibility which are related to the shopping experience for consumers, affect the adoption of innovation, and some past studies have also used these three constructs to conduct models in m-commerce (Wu & Wang, 2005; Joaquín et al., 2009). Hence, the shopping experience of consumers may affect their purchase behavior in online stores. Future studies may attempt to include facilitating conditions or compatibility in their models in order to explore whether life style or shopping experience of consumers will influence purchase behavior in order to better understand the needs of consumers.

Fourth, this study only used a cell phone to represent a high-tech product, so future research can extend the types of high-tech products and can include more products, such as computers, MP3 players, or PDAs and so on, to explore the intention to purchase high-tech products in online stores.

REFERENCE


