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Perceived risk of information security and privacy in online shopping: A study of environmentally sustainable products

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Consumers' information security and privacy for online shopping is a fundamental concern of decision-making for purchase. In this study, the technology acceptance model was used as a framework to explore website characteristics related to perceived risk of information security and purchase intention. A survey was conducted with a sample size of 387 online shoppers, methodology was done using LISREL 8.54 and SPSS 12.0 to perform factor analysis in order to obtain the factors of the construct and to measure their validity and reliability, the study revealed that website characteristics positively influence perceived risk of information security and privacy and further, have an impact on purchase intention. This study showed that perceived risk of information security and privacy on a website is strongly related to purchase intention. Website management must therefore be strengthened- first, by upgrading the network security of e-commerce technology, and second, by developing e-commerce security management systems. Moreover, a website platform should be constructed to improve awareness of consumer information security and to ensure a secure environment for online shopping. Finally, it is important to strengthen integrity management in order to enable consumers to securely buy goods online.

Key words: TAM, perceived risk of information security and privacy, purchase intention, environmentally sustainable products.

INTRODUCTION

In the development of online shopping, many issues have been exposed as major reasons for restricting the development of electronic commerce. Security is the most important one of these. In order to boost e-commerce and ensure improved services for the development of national economies, it is extremely important to solve the security problem in electronic commerce (Hashim et al., 2010). The purchase of environmentally friendly products is growing given the current situation, and this is not simply a result of marketing but is based on actual consumer preferences (Dangelico and Pujari, 2010). Environmentally sustainable products are chosen

because they can be broken down, and their manufacturing process does not produce toxic substances and gas (Chen et al., 2010). Consumers can learn about the value of goods through website features such as product information quality, website design style, transaction and delivery capability, and efficiency service quality; however, if there is no information security mechanisms in place, purchase intention will be adversely affected. This information security factor can be exploited sufficiently depending on Internet retailers' ability to meet customers' expectations in the virtual shopping environment (Zeithaml et al., 2002; Bauer et al., 2006; Chen and Barnes, 2007; Chang and Chen, 2008). Perceived risk of information security and privacy are important elements in the process of consumption through the Internet (Wang et al., 2004; Yousafzai et al., 2005; Martin and Camarero, 2008; Rapp et al., 2009;

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Shin, 2010; Kayworth and Whitten, 2010). The factors related to website operators, such as the construction of a secure network environment for consumption in order to meet consumer demands as well as the promotion of purchase intention, enhance the network of consumer value and customer satisfaction. Through the Internet, consumers are affected by security threats posed by network information flow, logistics, and cash flow; of these, information flow is the most important as it facilitates the completion of the other two factors. In addition, business transactions, security, Internet openness, the inherent lack of security in the transfer agreement, software, system vulnerability, and lack of credibility are important factors (Alam, 2009). Finally, there are overall security threats to the system, including information leakage, tampering, identity, and privacy leakage (Lu et al., 2010). This study will focus on the factors that influence consumers to purchase products online.

The theory used in this study is the Technology Acceptance Model (TAM), which encompasses perceived usefulness (that is, product quality information and efficiency service quality) and perceived ease of use (that is, website design style and transaction and delivery capability). The study explores environmentally sustainable products in relation to consumer adoption of shopping website characteristics and perceived risk of information security and privacy. The objective of this study is to explore the website characteristics that affect consumers' purchase intention in online stores featuring environmentally sustainable products. We conducted interviews and administered a questionnaire survey targeted at online shoppers in Taiwan through vendors such as Leezen, Homemaker Union, Orange Mart, and Yogi House International, focusing on perceived risk of information security and privacy as the mediating factors.

Our analysis is organized as follows. In the remainder of the introduction, we provide a conceptual background to our hypothesized model in which we outline five formal hypotheses. This is followed by an introduction to the context of this study-perceived risk of information security and privacy-as well as a description of the research materials and methods and a discussion of the results. Finally discussion of the managerial implications of the findings, addresses the limitations of the study, and offers suggestions for future research.

Environmentally sustainable products

Many studies have shown that green products are a company's product development mainstream, there are many aspects that need to be discussed urgently (Dangelico and Pujari, 2010; Baumann et al., 2002). In particular, these products are sold on the Internet and the environment is the starting point of marketing (Rapp et al., 2009; Ijomah et al., 2007). Environmentally sustainable products were chosen for this study because

they can be broken down, and their manufacturing process does not produce toxic substances and gas (Chen et al., 2010). They also reduce waste materials, it can be used as a source of energy and they prevent pollution (Sharma and Henriques, 2005); moreover, they are a favorite in mass consumer product trends (Dangelico and Pujari, 2010). We conducted interviews and administered a questionnaire survey targeted at online shoppers in Taiwan through vendors such as Leezen, Homemaker Union, Orange Mart, and Yogi House International. These product categories can be divided into kitchen, toilet and personal cleaning products (such as bitter tea powder, natural toothpaste, and natural detergents), cleaning agents with lotion, and portable dishes. These products are made with natural materials; they are sold to the public on the Internet, and each company has access to consumers through its brand. In this study, we clean the framework of sustainable products for the research products.

This study uses environmentally sustainable products to investigate consumers' perceived risk of information security and privacy when they buy goods via the Internet. We hypothesize that products' perceived usefulness and perceived ease of use will not affect consumers' perception of information security risks, but will affect the purchase intention.

Perceived risk of information security and privacy

This study addresses perceived risk of information security and privacy with respect to website shopping services designed as trading platforms, which can eliminate any middlemen between the vendors and consumers and facilitate a safe and legal authentication mechanism as well as a secure transaction platform (Wang et al., 2004; Yousafzai et al., 2005; Martin and Camarero, 2008; Rapp et al., 2009; Shin, 2010; Kayworth and Whitten, 2010). Perceived risk is considered a fundamental concept of consumer behavior and is often used to explain customers' risk perceptions and reduction methods (Mitra et al., 1999; Shin, 2010). Previous studies have shown that perceived risk derives from consumer uncertainty, especially in the case of Internet shopping (Bakos, 1997; Martin and Camarero, 2008). However, Youn (2009) mentioned that information security and privacy are related to the uncertainty associated with how personal information is handled by online establishments and who has access to it. On the other hand, consumers' collected information is very fragile; they cannot prove that the information from a shopping website-such as assertions that a product is non-toxic or environmentally friendly-is correct (Milne and Culnan, 2004).

The focus of this study is the perception of "perceived risk of information security and privacy." This is important to consumers engaged in online shopping transactions and differs from the traditional theory of perceived risk

dimensions. This constitutes a gap in the literature, since prior studies have rarely addressed this issue. Information security and privacy on the Internet are critical issues in online shopping (Huang and Chun, 2010). Rapp et al. (2009) found that most consumers are unaware of how their private information will be handled and used. Sheehan and Hoy (1999) also mentioned that consumers avoid websites that require personal data for registration, leading some people to falsify or provide incomplete details. Many scholars emphasize that website security and privacy should encompass confidentiality of information, information integrity, communication of non-repudiation, authentication security, IT effectiveness, and protection of personal privacy, all of which relate to website characteristics (Rapp et al., 2009; Shin, 2010; Kayworth and Whitten, 2010). Studies of this enterprise have addressed banking services, such as those by Hernandez and Mazzon (2007) and Chen and Barnes (2007). While these works examined e-banking transactions because consumers need to avoid obstacles to trade online, Lu et al. (2010) argue that information security and privacy are relatively important in online tax filing. On the other hand, Shin (2010) also mentioned that perceived risk of information influences consumer trust in online shopping, while Rapp et al. (2009) stated that privacy on the Internet should be a concern between buyers and sellers, as most consumers are only willing to trust sites that reveal personal information. Consideration of this aspect is the main contribution of this study.

Product quality information

Three types of factors related to product quality information were measured in this study: product information, website reputation, and product price. In reference to belief dimensions, these three factors indicate three belief dimensions, based on social psychology theories such as the theory of reasoned action (TRA) (Ajzen and Fishbein, 1980; Fishbein and Ajzen, 1975) and the theory of planned behavior (TPB) (Ajzen, 1985), as well as TAM (Davis, 1989; Davis et al., 1992). These theories have been verified and support the content of this study. Perceived usefulness is the degree to which a person believes that using a particular system would enhance his or her job performance; in this paper, we adapt this concept to the effect of consumer experience on online shopping (Davis, 1989). Here, perceived usefulness, in reference to Davis's (1989) argument, refers to product quality information and efficiency of service quality that would extend a sense of security to consumers and ensure a more confident purchasing behavior, thereby inducing them to purchase more and more frequently (Alam et al., 2010). Good product quality information can increase customers' confidence and trust in website shopping (Lee, 2009; Kim et al., 2008; Makgosa and Mohube, 2007). The present study also

explores the importance of product quality information-in this case, for environmentally sustainable products purchased through the Internet-and its impact on reducing perceived risk of information security and privacy.

First, better product information can help consumers make more confident decisions during online purchases because consumers trust the website and therefore perceive a lower risk of information security. This can increase consumer purchase intention (Lee, 2009; Makgosa and Mohube, 2007; Elliott and Speck, 2005), especially for environmentally sustainable products, which are not standardized and for which product quality is hard to control. Second, many studies have shown the importance of website reputation in online shopping. Ba and Pavlou (2002) mentioned that better feedback profiles induce higher trust. In other words, if consumers believe that a particular shopping website can be trusted, their purchase intention is enhanced. An e-tailer's reputation positively relates to consumers' trust in the fact that the website will not reveal personal information to others (Chang and Chen, 2008). A positive reputation has been proven to be a critical factor in reducing consumers' perceived risk of information security (Kim et al., 2008). Finally, Sweeney et al. (1999) mentioned that product prices are a factor that affects purchase intention; therefore, if the quality of the product is considered to be better, the price may have a negative impact on consumers' perceived risk (Shimp and Bearden, 1982). From another perspective, high prices may be outside of the customers' budget, in which case the website will face financial risks (Grewal et al., 1994; Chen and Dubinsky, 2003). On the basis of this information, we make the following hypothesis:

Hypothesis 1: Product quality information has a positive impact on reducing customers' perceived risk of information security and privacy.

Efficiency service quality

A large number of studies have shown that perceived usefulness affects whether or not customers will use technology (Chang and Chen, 2008; Jahangir and Begum, 2008; Makgosa and Mohube, 2007; Chen and Barnes, 2007; Guriting and Ndubisi, 2006). Efficiency service quality is used to measure the excellence and precision of the services that online customers receive. Previous studies have argued that customers' perceived usefulness of products is related to the quality of online service, which proves the importance of network services (Zeithaml et al., 2002). Other scholars have also tested the relationship between efficiency service quality and website success using quick response, assurance, reliability, empathy, and follow-up service as variables to estimate efficiency service quality (Liu and Arnett, 2000). Wolfenbarger and Gilly (2003) clarified that efficiency

service quality affects websites' success as much as perceived risk of information security and privacy. On the other hand, Lin (2007) indicated that efficiency service quality for online bookstores had a strong impact on customer satisfaction, especially in the realm of trust. This shows that perceived risk of online information security is very important to ensure quality of service. On the basis of this information, we make the following hypothesis:

Hypothesis 2: Efficiency service quality has a positive influence on the perceived risk of information security and privacy.

Website design

Many scholars believe that the perceived ease of use stemming from a well-designed website enables consumers to save time, and at no cost to that individual (Davis et al., 1989; Mathieson, 1991; Gahtani, 2001; Jahangir and Begum, 2008). In this study, we measured how attractive, easy to read, visually pleasing and visually appealing each website was. The aesthetic design of the site will affect consumers' willingness to use it; if the design is very commonplace, it will not attract consumers, which will ensure that they do not leave any personal information behind. This is similar to the findings of Loiacono et al. (2002), which show that visual appeal has a significant correlation with customers' perceived risk of information security and purchase intention. Many scholars have researched whether perceived ease of use has a significant influence on purchase intention, whether direct or indirect (Hernandez and Mazzon, 2007; Guriting and Ndubisi, 2006; Venkatesh, 2000; Venkatesh and Morris, 2000; Venkatesh and Davis, 1996; Martin and Camarero, 2008), while website design style's effect on perceived ease of use has received relatively little research. Therefore, this study suggests that consumers enter the online shopping process because of a website's design style, and perceived risks of information security considerations increase when web design is not aesthetically pleasing, as such sites will not attract consumers.

Chen and Barnes (2007) found that perceived ease of use significantly affects customer adaptation intentions. From another perspective, Allagui and Lemoine (2008) also mentioned that web aesthetics affect online viewers' attitude towards a website, which further affects their purchase intention. Chang and Chen (2008) mentioned that a well-designed website increases consumers' positive perception of the website, decreasing perceived risk of information security, and a viewer with a positive perception is more likely to become a customer. On the basis of this information, we make the following hypothesis:

Hypothesis 3: Website design style is positively related to perceived risk of information security and privacy.

Transaction and delivery capability

Formal research on website ease of use is sparse (Zeithaml et al., 2002), but the broad scope of this study was constructed within the technology environment in the workplace. Castefranchi and Tan (2002) believe that there are many problems when a computer is used as a study medium. For example, it is easy to make a false report about gender or personal information in virtual society. Since this study focuses on customers' purchasing behavior in an online shopping website, the capability for transaction and delivery on an e-commerce site should be discussed.

Liu and Arnett (2000) used the determinants of "system quality" to measure the importance of the customer in transaction process control, such as tracking order status, ease of use, confidence, and privacy, all of which are also associated with the transaction process. Many scholars have mentioned that transaction capability helps build customer satisfaction and that transaction capability within the website is a measure of the ability to order online, make online payments, and track orders. In the process, this will reduce customers' perception of information security risks (Liu and Arnett, 2000; Kim and Stoel, 2004; Liu et al., 2008). If customers can control the transaction process through the Internet, check their order, and contact the online retailer, their uncertainty regarding perceived risk of information security and privacy can be reduced.

Delivery capacity emphasizes the efficiency of online purchasing. It is important to maintain the integrity of the product by ensuring that is not damaged or expired, so efficiency is very important (Parsons, 2002; Bauer et al., 2006). This study therefore studies delivery capability, testing websites' capability of providing a diversified delivery service and of guaranteeing an effective and accurate delivery. If an online retailer can provide accurate delivery information when accepting an order, this will create a perceived value of the transaction for customers, which will help them feel confident about placing the order and reduce their perceived risk of information security and privacy. As previous studies have not measured the direct relationship between delivery capability and perceived risk of information security and privacy, this relationship will be investigated in this research. On the basis of this information, we make the following hypothesis:

Hypothesis 4: Transaction and delivery capability are positively related to perceived risk of information security and privacy.

Purchase intention

Many researchers have argued that high perceived risk will reduce purchase intention (Makgosa and Mohube, 2007; Kim et al., 2008; Chang and Chen, 2008; Lee, 2009

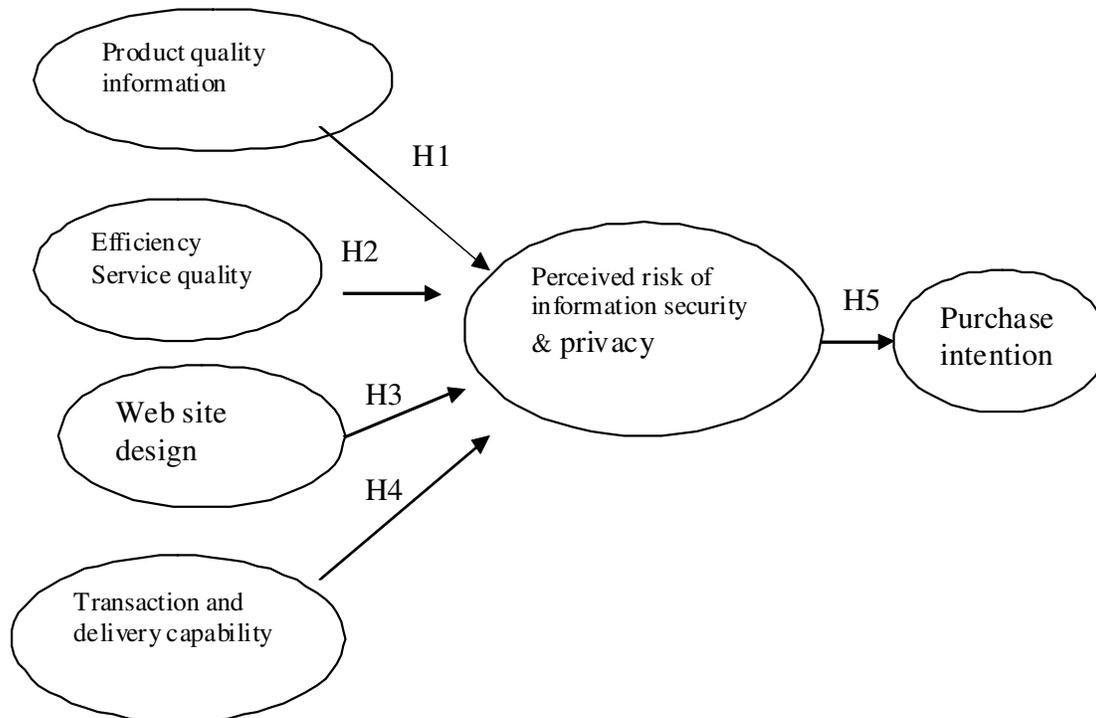


Figure 1. Research framework.

2009). This study clarifies that perceived risk may have a negative impact on customers' purchase intention, especially in terms of environmentally sustainable products, which are not standardized and for which product quality is hard to control. Customers may perceive a higher risk for these than for other products, such as clothes and books, which are the best-selling items on the Internet (Lee, 2009; Huang and Yang, 2010). Thus, the idea of perceived risk is extremely important for environmentally sustainable products, and online retailers need to take steps to reduce customers' perceived risk if they want to increase those customers' purchasing intention. On the basis of this information, we make the following hypothesis:

Hypothesis 5: Reducing perceived risk of information security and privacy can increase customer purchase intention.

MATERIALS AND METHODS

Conceptual framework

This study conducted the following analysis. First, we investigated whether perceived risk of information security and privacy mediates the relationship between product quality information, efficiency service quality, website design style, and transaction and delivery capability. Second, we considered both direct and mediated relationships between product quality information, efficiency service quality, website design style, and transaction and delivery capability

where perceived risk of information security and privacy was a mediating variable, in order to draw causal inferences regarding the relationship among the studied variables. The framework of this study is shown in Figure 1.

Sample

Questionnaires with well-structured, closed questions were designed for data collection purposes. In accordance with the research model, the questionnaires comprised seven sections and included questions on product quality information (6 items), efficiency service quality (5 items), website design (5 items), transaction and delivery capability (6 items), perceived risk of information security and privacy (6 items), purchase intention (5 items), and basic information of respondents (6 items). The questionnaire items and references are shown in Table 1.

Data was collected from 387 online shopping users (the response rate was 67%). The respondents were evidently familiar with the online shopping process and environmentally sustainable products. The average age of the respondents was 32 years. About half (49%) of the respondents had more than two years of experience with online shopping. More than half the respondents bought products online on more than five occasions and made online purchases an average of one to two times per month.

Measures

Environmentally sustainable products in Taiwan have been gradually accepted by consumers. To verify the assumptions related to this observation, this study examines several online consumer stores, such as Leezen, Homemaker Union, Orange Mart, and Yogi House International. This study used both qualitative and quantitative methods to examine these relationships and conducted case

Table 1. Questionnaire items and references.

| Measured variable | Question item | Measured item | Reference |
|--|---------------|---|--|
| Perceived risk of information security and privacy | 6 | This website will protect my private information | Bakos (1997), Mitra et al. (1999) |
| | | I have security on this website | Milne and Culnan (2004) |
| | | Authorization mechanisms of this site make me feel comfortable | Chen and Barnes (2007) |
| | | This website provides complete consumer information | Hernandez and Mazzon (2007) |
| | | This website will help me reduce consumer uncertainty | Youn (2009),Huang and Chun (2010),Lu et al. (2010) |
| | | I trust this website for any environmentally sustainable product | |
| Product quality information | 6 | This website provides product information that is very aware | Ba and Pavlou (2002) |
| | | For me, the website's reputation is very important | Chen and Dubinsky (2003) |
| | | The product price provided by the website should be even lower than the actual price | Makgosa and Mohube (2007) |
| | | It is important that a website describes product features clearly ⁵ . When considering buying environmentally sustainable products on the Internet, discounts are important for me | Kim et al. (2008) |
| | | When considering buying environmentally sustainable products on the Internet, my consideration is, "the higher the price, the better the quality" | Chang and Chen (2008) |
| | | | Lee (2009) |
| Efficiency service quality | 5 | I can always contact retailers online | Chang and Chen (2008) |
| | | Rapid response is important to me | Jahangir and Begum (2008) |
| | | After-sales services are very important to me | Guriting and Ndubisi (2006) |
| | | When products have problems, you can always see them through the website | Lin (2007) |
| | | If I have a question, the site will answer it as soon as possible | |
| Website design | 5 | This website attracts me to use it | Gahtani (2001) |
| | | The content of the website information is easy to read | Loiacono et al. (2002) |
| | | The website should be visually pleasing | Chen and Barnes (2007) |
| | | This website let me quickly learn to use it | Jahangir and Begum (2008) |
| | | Navigating through the website should be easy for me | Chang and Chen (2008) |
| Transaction and delivery capability | 6 | This website can be accessed directly online | Liu and Arnett (2000) |
| | | Almost all business processes can be completed via the website | Kim and Stoel (2004) |
| | | This website allows me to track goods | Bauer et al. (2006) |
| | | The website should provide diversified delivery modes (post, express delivery, home delivery) | Liu et al. (2008) |
| | | The product can be ordered on the site after picking it up at the store | |
| | | Overall, this store's delivery is fast | |
| Purchase intention | 5 | Information on this website is very clear, so I am confident and will continue to buy | Makgosa and Mohube (2007) |
| | | When purchasing from this website, I am not worried about the product failing to perform to my satisfaction | Kim et al. (2008) Chang and Chen (2008) |
| | | This website provides environmentally sustainable products that I would like to continue to buy | Lee (2009) |
| | | I will purchase products from this store | |
| | | I am confident that I will continue to use this website. | |

Table 2. Correlation matrix of this research.

| | PQI | ESQ | WDS | T&D | PRISP | PI |
|-------|-----|-------|---------|--------|---------|--------|
| PQI | | 0.28* | 0.194** | 0.43** | 0.167** | 0.31** |
| ESQ | | | 0.38** | 0.35** | 0.39** | 0.31** |
| WDS | | | | 0.76* | 0.73** | 0.69** |
| T&D | | | | | 0.89* | 0.86** |
| PRISP | | | | | | 0.53* |
| PI | | | | | | |

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. (PQI = product quality information, ESQ = efficiency service quality, WDS = website design style, T&D = transaction and delivery capability, PRISP = perceived risk of information security and privacy, PI = purchase intention).

study interviews with people who had experience with online shopping, before developing the formal questionnaire. Through these interviews, we found information that corresponded to our hypotheses and determined whether our measurement items could correctly represent the research construct. Questionnaires were measured on a 5-item scale to measure data collected through the website platform, targeted at consumers who purchase environmentally sustainable products in Taiwan.

This study used content validity, convergent validity, and discriminant validity, which are commonly used by researchers. In this study, the development of measurement scales was based on an extensive literature review and modified by professors and experts, ensuring the content validity of the items. This study evaluated reliability on the basis of Cronbach's α and item-to-total value. Cronbach's α for all constructs exceeded 0.7, which achieved Nunnally's (1978) threshold level of acceptable reliability. The data was subjected to confirmatory factor analysis (CFA) by means of LISREL 8.54 and SPSS 12.0 to perform factor analysis in order to obtain the factors of the construct and to measure their validity and reliability. Cronbach's α coefficient was adopted to test the reliability of research variables. The Cronbach's α of all constructs were above 0.79–0.89, as shown in Table 2, and all of the construct measurements were modified from previous studies and were consistent with their definitions.

Analysis

In order to achieve the research aim and test the hypotheses, LISREL 8.54 was used to perform these analyses. Comprehensive instrument validation and reliability procedures were followed in order to validate the instrument empirically. For the constructs of perceived usefulness (i.e., product quality information and efficiency service quality) and perceived ease of use (i.e., website design style and transaction and delivery capability), this study used CFA as a confirmatory test to measure validity and reliability, while other constructs were examined with SEM was used to test the model fit. "Structural equation modeling seeks to explain the relationships among multiple variables; it examines the structure of interrelationships expressed in a series of equations, similar to a series of multiple regression equations" (Hair et al., 2006). We then used structure model analysis to examine the coefficients of the baseline model on Hypotheses 1 through 5.

RESULTS

The first stage of this study assumed a reliability and validity analysis. Data from 387 sites were used regarding the purchase of environmentally sustainable products by consumers. The variables used to measure the

correlation matrix of questionnaires are shown in Table 2. In order to study perceived usefulness, perceived ease of use, perceived risk of information security and privacy, and purchase intention, this study used CFA to confirm discriminant validity and convergent validity. After deleting factor loadings less than 0.4, as well as standard residuals greater than 2.58 or modification indexes greater than 3.84 for the question items (Hair et al., 2006), the CFA yielded the results of the variables shown in Table 3. We also calculated composite reliability (CR) and variance extracted (VE) of each variable. Table 3 shows the reliability of each combination of variables between 0.79 to 0.89. The minimum value was greater than 0.7, so the measurement variables of this study showed sufficient reliability. Variance extracted in the 0.65 to 0.79 range between the measured variables of this study show sufficient convergent validity. Table 3 shows that the p value of χ^2 is greater than .1, the GFI and NFI values are greater than 0.9, the RMSEA values are less than 0.08, and the CN are greater than 200, showing that the model fit of the observed data was good among the variables that have discriminant validity (Hair et al., 2006).

Several model fit indices have been used in related research and recommended values from Hair et al. (2006) are shown in Table 4. As suggested, the model fit was assessed by several indices: the recommended value of χ^2/df should be less than 3; the value of CFI, NFI, and GFI should be greater than .90; and RMSEA should be less than 0.70. In this study, all values were in line with those recommended.

Table 4 shows the results of the study of the SEM model, which tested the hypothesis for the path analysis. The overall fit measures indicated that the hypothesized model is a good representation of the structures underlying the observed data, $\chi^2/df = 1.99$, goodness of fit index = 0.934, adjusted goodness of fit index = 0.801, comparative fit index = 0.933, normed fit index = 0.912, and root mean square error of approximation = 0.051. According to the above data, the hypothesis test revealed that the model has a good fit. In the model, all paths were found to be significant, as shown in Table 5. The results indicated that there is a relationship between online shopping for environmentally sustainable products and

Table 3. Confirmatory factor analysis.

| Latent variable | Measured variables | Items | CR | VE | GFI | AGFI | RMESA | CN |
|--|-------------------------------------|-------|------|------|------|------|-------|-----|
| Perceived usefulness | Product quality information | 6 | 0.79 | 0.67 | 0.96 | 0.95 | 0.053 | 289 |
| | Efficiency service quality | 5 | 0.87 | 0.77 | | | | |
| Perceived ease of use | Website design style | 5 | 0.89 | 0.79 | 0.97 | 0.93 | 0.057 | 276 |
| | Transaction and delivery capability | 6 | 0.83 | 0.69 | | | | |
| Perceived risk of information security and privacy | | 6 | 0.88 | 0.75 | 0.98 | 0.93 | 0.078 | 243 |
| Purchase intention | | 5 | 0.79 | 0.65 | 0.95 | 0.92 | 0.068 | 250 |

Table 4. Model fit analysis.

| Fit indices | χ^2/df | CFI | NFI | RMSEA | AGFI | GFI |
|-------------------|-------------|-------|-------|-------|-------|-------|
| Observed value | 1.99 | 0.933 | 0.912 | .051 | 0.801 | 0.934 |
| Recommended value | ?3 | >.9 | >.9 | <.07 | >.9 | >.9 |

Table 5. Path analysis and hypotheses test.

| Path | Hypothesis | Coefficient | Results |
|-----------|------------|-------------|-----------|
| PQI→PRISP | H1 | 0.47*** | Supported |
| ESQ→PRISP | H2 | 0.671*** | Supported |
| WDS→PRISP | H3 | 0.622*** | Supported |
| T&D→PRISP | H4 | 0.434*** | Supported |
| PRISP→PI | H5 | 0.206* | Supported |

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

website quality with perceived risk of information security and privacy, and that purchase intention is positively related to the assumption that the said relationship is established.

DISCUSSION

This study investigated the effect of website quality-specifically product quality information, efficiency service quality, website design style, and transaction and delivery capabilities-on perceived risk of information security and privacy and its relationship with purchase intention. The results show that consumers who purchase environmentally sustainable products pay attention to the quality of the websites from which they purchase those products, specifically whether the manufacturers will maintain information security. This thereby affects the consumers' purchase intention. Interviews with 387 respondents revealed that these products often have no particular standard that can be followed, so consumers can only rely on these websites to provide product information. Participants determined whether or not to purchase items from a particular site based on efficiency service quality,

the site's ease of use, payment mechanisms, and trust in information, as well as the belief that the site will protect their personal information.

Overall, the results showed that perceived risk of information security and privacy and the TAM model involve two dimensions: perceived ease of use and perceived usefulness. This shows that when users want to purchase technology products, they select those products through a particular website because they do not have to worry about leakage of personal information, as incomplete information quality affects purchase intention. Moreover, the speed of product delivery will cause consumers to worry about the impact of product use time, as well as the problems related to perceived risk of information security. If sellers do not improve their IT systems to enhance the safety awareness of buyers, it will affect consumers' willingness to buy online.

The results supported most of the hypothesized relationships. Therefore, this study proposes the following conclusion. Product quality information and efficiency service quality will positively impact the perceived risk of information security and privacy and e-governance (Alam, 2009). Based on this result and the original definition of the perceived usefulness, we can infer that

the online buying process is not clear if consumers purchase the product information carefully, do not endorse the information provided by the website, and may not intend to spend too much money. This study also shows that consumers who use shopping sites can gain confidence from information security and can thereby be comfortable with buying goods online.

In this study, website design style and transaction and delivery capability were shown to positively impact the perceived risk of information security and privacy. In particular, website design style affects online viewers' attitude towards a website. This accord with prior research asserting that a well-designed website increases consumers' positive perception and reduces perceived risk of information security and privacy. This also affects transaction and delivery capability, in that customers attach importance to an efficient online shopping process.

Finally, the results show that if customers worry about whether their website information will be use for other purposes, it will reduce their purchase intention. Further, this study found that if websites that sell environmentally sustainable products, which are not standardized and for which product quality is hard to control, do not guarantee information security, consumers will actually reduce consumption. Thus, online shopping managers must pay attention to the following issues. First, e-commerce computer network security technologies, such as firewalls, virtual private networks, intrusion detection systems, and virus prevention techniques, should be used to strengthen online security. Second, e-commerce security management systems should be developed, including personnel management, security systems, tracking audit systems, maintenance systems, data backup systems, and regular cleaning of virus systems. Finally, management systems stress the importance of preserving the trust of consumers and asserting business confidence; refraining from doing so will enhance information security risks, including transaction denial, denial, and destruction of personal privacy. For this reason, it is of primary importance to strengthen confidence in online shopping by educating consumers and by establishing a credit system (Raad et al., 2010).

The managerial implications of this study are to provide online shopping companies with information security policy considerations, and to help companies to develop online marketing strategies using information technology regarding consumer behavior and psychological impact. Future research can create an in-depth understanding of security perceived risk and consumer behavior.

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