PRIS: A Multiple-Item Scale for Measuring Perceived Risk of Internet Shopping

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ABSTRACT

The purpose of this study is to report the development of a scale to measure perceived risk associated with online shopping. This research identified a model of perceived risks consisting of four components: financial risk, product performance risk, time/convenience risk and privacy/security risk. Exploratory and confirmatory factor analyses were used, and convergent and discriminant validity were assessed in the scale development procedures to support the Perceived Risk of Internet Shopping (PRIS) scale as a reliable and valid instrument. Nomological net constructed for the validity of PRIS scale empirically supported the relationships among perceived risk, familiarity and knowledge of Internet and computer, Internet experience, prior remote shopping behavior, trust in-e-store, and domain-specific innovativeness. This PRIS scale will contribute to the investigation and understanding of the nature and consequences of perceived risk in the online shopping environment. It provides a reliable and well-validated scale to compare the academic studies and move the research forward.

Keywords: Risk Perception, Internet Shopping, Measuring Scale

INTRODUCTION

The Internet, as an extensive shopping channel, provides consumers with a number of benefits over traditional retail channels. The Internet stores vast amounts of information, serves as a communication and transaction medium, and provides the benefit of asynchrony (i.e., the Internet retailer is available for shoppers any time of the day or night) (Peterson, Balasubramanian & Bronnenberg, 1998; Swaminathan, Lepkowska-White, & Rao, 1999). The wide variety of information on the Internet allows consumers to browse products/services extensively, tailor specific information to their needs, compare prices, place/change orders, and receive feedback without traveling to a physical retailing entity (Hoffman & Novak, 1996; Turner, 1999). Yet despite the benefits of online shopping, many consumers still hesitate to shop online. This reluctance may be due to the risks associated with Internet purchasing.

Several authors (Bhatnagar, Misra, & Rao, 2000; Zellner, Forests, Morris & Lee, 1999) have attributed perceived risk or “fear” as one critical impediment to Internet shopping. However, ambiguous terms for risk have been applied in these studies, including uncertainty (Bhatnagar et al., 2000), fear and potential loss (Park & Jun, 2003), or general attitudes toward different risk elements (Liebermann & Stashevsky, 2002; Swaminathan et al., 1999). Different definitions, single item measures, and inaccurate linguistic measures of perceived risk were often employed in Internet shopping related research (Bhatnagar & Ghose, 2002; Cases, 2002; Forsythe & Shi, 2003; Hassan et al., 2006). These ambiguous terms and their various definitions hinder a thorough investigation of perceived risk in the Internet context. Although different dimensions of risk have been identified for the traditional shopping context, the unique characteristics of the Internet shopping environment necessitate a unique method to measure the perceived risk in this environment.
The purpose of this study is twofold: (1) to develop a multi-item scale called PRIS for assessing consumer’s perceived risk of Internet shopping, and (2) to discuss the scale’s properties and potential applications. The basic steps which were employed in constructing the scale closely parallel procedures recommended in Churchill’s (1979) paradigm for developing better measures of marketing constructs.

LITERATURE REVIEW AND HYPOTHESIS

Definition of Perceived Risk

Kogan and Wallach (1964) suggested that the concept of risk might have two different facets: “chance” where the focus was on probability and “danger” where the emphasis was on severity of negative consequences. Cox (1967) also assumed that perceived risk contains two aspects, namely “the amount that would be lost if the consequences of an act were not favorable, and the individuals’ subjective feeling of certainty that the consequences will be unfavorable” (p. 37). Bettman (1973) substituted importance for consequences/dangers to conceptualize risk dimensionality, for in some cases it was difficult to distinguish whether uncertainty or consequences were being measured (e.g. “How risky is the purchase of _____?”). The term “expected loss” was introduced in Peter and Tarpey’s (1975) consumer decision making study. Following the concept of probability and importance, they conceptualized this construct as a dual-component, multi-faceted phenomenon: probability of loss and importance of loss.

In the online shopping context, Tan (1999) and Cases (2002), in their risk-reduction strategies in online context, adapted this two-component perspective, the probability of loss (likelihood of occurrence) and the importance of loss (importance of event), to operationally define various perceived risk dimensions. Based on the Multiplication Law of Probability Theory (Rice, 1995, p.17), the study multiplied these two parts for understanding perceived risk in Internet shopping. The Multiplication Law of Probability Theory states:

Let A and B be events and assume P(B) ≠ 0. Then P(A \cap B) = P(A|B)P(B)

By applying this multiplicative “concept” to risk measurement, P(B) represents the probability of the B event happening while shopping online and P(A|B) expresses the importance of loss under the condition that the B event occurred. The probability of risk discussed in this study is a consumer’s subjective risk. In order to distinguish subjective risk from objective risk, the possibility of loss can better articulate the concept of perceived risk. Therefore, the present study operationally defined perceived risk as: Types of perceived risk = \Sigma possibility of loss × importance of loss.

Dimensions of Perceived Risk in Internet Shopping

In investigating consumer patronage in Internet shopping, Forsythe and Shi (2003) defined four types of perceived risk specific to the Internet context: financial, product performance, psychological, and time/convenience risk. In an attempt to exhaust the facets of perceived risk in Internet shopping and to construct a valid measurement scale, the present study integrates Forsythe and Shi’s four dimensions with the classical dimensions in traditional shopping contexts along with particular aspects of the Internet’s characteristics, which then serve as the basic structure of the Internet risk domains from which items are derived for the PRIS scale.

Financial Risk: Perceived financial risk is defined as the possibility of and the importance of monetary loss arising from online shopping (Jacoby & Kaplan, 1972). In addition to the types of economic risk reported in academic research, some other concerns have recently been brought out for
academic attention. Turner (1999) reminded consumers about the variety of shipping charges. Some sites offer free shipping to lure more buyers while charging hidden fees, such as handling fees (Krantz, 2003). Consumers may think it is risky to pay extra for overnight delivery because the items may not be delivered for nearly a week. Purchasing problematic or unsatisfactory products from unreliable vendors also potentially increases the costs of online buying (Lim, 2003).

**Product Performance Risk:** Product performance risk is defined as the possibility and the importance that consumers place on purchased products that do not perform as expected or can be used for only a short period of time (Jacoby & Kaplan, 1972; Lim, 2003). This risk is intensified in the Internet context because consumers cannot physically see and touch the product (Liebermann & Stashevsky, 2002). Concern about a product’s warranty accompanies consumers’ perception of product performance risk (Turner, 1999). The “gray market” merchandise, often electronics or other big-ticket items that do not come directly from the manufacturer or the authorized retailers, probably do not have manufacturer warranties. As a result, purchasers may bear an increased product risk due to the uncertainty of product quality.

**Physical Risk:** Perceived physical risk is defined as the possibility and the importance that consumers place on products that are harmful to an individual’s health (Jacoby & Kaplan, 1972; Lim, 2003). Consumers lack real-time interaction with people while shopping online; no sales assistant can tailor information about products to the individual consumer’s particular needs (Swinyard & Smith, 2003). Thus, the possible injury resulting from misusing the product for lack of personal instruction is great.

**Psychological Risk:** Perceived psychological risk is defined as the possibility that and the importance that the individual suffers emotional stress because of his/her buying behavior (Jacoby & Kaplan, 1972; Lim, 2003). Shopping in the Internet context, as in the traditional one, will produce feelings of disappointment, frustration, and shame for buyers when his/her purchased goods do not fit well with his/her self-image or self-concept (Forsythe & Shi, 2003). In the cyber world where individuals express a perceived concern that the Internet user’s privacy may be violated (Benassi, 1999; Maignan & Lukas, 1997), the uncomfortable feelings that result from revealing personal information may be characterized as a psychological risk (Forsythe & Shi, 2003). Impulse buying (Power, 1999) and Internet addiction (Armstrong, Phillips, and Saling (2000) brought a psychological disturbance to Internet shoppers could be claimed as potential perceive risks.

**Social Risk:** Social risk is defined as the possibility and the importance that other people’s perceptions will be affected by an individual’s online purchasing behavior (Lim, 2003). Social risk includes the chance that the products purchased through online shopping might affect the way others think of the purchaser and also that consumers’ shopping behavior will not be accepted by other society members. From another perspective, Mardesich (1999) and Power (1999) both mentioned the problems of product shortage and timely holiday delivery. Not delivering holiday gifts in a timely manner might have a negative influence on social interactions with friends, thus arousing a perceived social risk in online shoppers. A Forrester Research Group study (2000) found that “the desire to speak to a store clerk before purchasing” was one of the skepticisms consumers’ expressed about buying online. This lack of human interaction was included as an aspect of social risk.

**Time/Convenience Risk:** Time/convenience risk is defined as the possibility and the importance of losing time and convenience when shopping online. Even with the advantage of shopping all hours, online shopping still raises the time/convenience risk because shoppers may experience difficulty navigating websites, submitting orders, and finding appropriate websites (Forsythe & Shi, 2003). In addition to shopping time, this dimension of time/convenience risk includes the time consumers wait for their products to arrive (Lim, 2003) and the time that online retailers take to handle unsatisfactory product
returns (Turner, 1999). In addition, inappropriate search engines may confront consumers with an overload of product and retail information (Forsythe & Shi, 2003). False hits or duplicated listings directed shoppers to confusing Web sites and pages, sometimes making them uncertain whether online shopping was worth the trouble.

**Privacy Risk:** Internet privacy risk is defined as the possibility and the importance that online retailers will attempt to collect, use, and distribute information about consumers and their behaviors (Federal Trade Commission, 1998). This privacy category included a variety of Internet shopper concerns about issues such as unauthorized sharing of personal information, undesired e-mails from online retailers to consumers’ email boxes, and undisclosed monitoring of shopping behavior (Miyazaki & Fernandez, 2001). By using Cookies and tracking software, Web vendors are able to identify Internet users’ click-and-viewing patterns, which are useful in profiling and targeting individual consumers (Milne, 2000). Stored consumer information on a database platform increases the possibility that the data could be assessed at a later date and used for purposes other than intended (Thomas & Maurer, 1997). Moreover, the digitalization of audio and video type data challenges threatens consumers’ privacy. In Lim’s focus group discussion (2003), participants perceived a high level of privacy risk when businesses did not provide a privacy policy or the privacy policies were difficult to find.

**Security Risk:** Security risk is defined as the possibility and the importance of “potentially malicious individuals who breach technological data protection devices to acquire a consumer’s personal, financial, or transaction-oriented information” as well as “fraudulent behavior by the online retailer” (Miyazaki & Fernandez, 2001). Consumer-related Internet security typically involves the encryption of transactions to prevent third-party fraud or theft (Machrone, 1998).

**Correlates of Risk in Internet Shopping**

Some factors are found to be conceptually related to the perceived risk of Internet shopping. This section develops hypotheses for a nomological net to examine the nomological validity of the proposed measure. This nomological net surrounding PRIS is shown in Figure 2.

**Familiarity with and Knowledge of Internet and Computer Technology:** Academic theorists and practitioners have suggested that consumers’ computer literacy impacts their online shopping behavior (Fox, 2005). Compared to online nonshoppers, online shoppers possess greater computer literacy, spend more time on their computers, and spend more time on the Internet (Swinyard & Smith, 2003). Low familiarity or comfort with technology and with Internet resources (e.g., vendor rating sites, shopping bots) were mentioned in in-depth interviews as obstacles faced by individuals with Internet connections at home but who hesitated purchasing online. Much of the risk perceived in online shopping is likely derived from the relative novelty of the Internet as a remote purchasing method (Miyazaki & Fernandez, 2001). From this perspective, familiarity with Internet knowledge and computer technology is hypothesized to have a negative influence on the overall perceived risk of Internet shopping.

**H1:** Familiarity with Internet knowledge and computer technology is negatively related to the perceived risks of Internet shopping.

**Internet Experience:** Many marketers believe that experience gained through the simple usage of the Internet for nonpurchase purposes, such as information gathering or noncommercial communication, would lead consumers to discover that some risks were exaggerated (Miyazaki & Fernandez, 2001). Bhatnagar et al. (2000) also proposed that the likelihood of purchasing on the Internet increases as a consumer’s experience on the Internet increases. Thus, it is argued that as nonpurchase-related Internet experience increases, levels of perceived risk of Internet shopping should decrease.

**H2:** Internet experience is negatively related to the perceived risks of Internet shopping.
**Prior Remote Shopping Behavior:** In addition to the Internet, telephone, mail-order, and television shopping broadcasts act as selling channels for remote retail transactions. Several research on telephone, mail-order, and TV purchasing (Jasper & Lan, 1992; Spence, Engel, & Blackwell, 1970) indicated that these three shopping venues presented certain risks that may be compared to the perceived risks of online shopping. Considering the similarities between these three remote communication/transaction methods, consumers who have previously shopped by phone, mail, or TV would experience less risk when online shopping than those who have not used these methods previously.

**H3:** The experience of telephone, mail-order, or TV shopping is negatively related to the perceived risk of Internet shopping.

**Trust in e-Store:** Trust is defined as confidence on the part of the trusting party that the trustworthy party is reliable, has high integrity, and is associated with such qualities as consistency, competency, honesty, fairness, responsibility, helpfulness, and benevolence (Morgan & Hunt, 1994). By examining the complexity-reduction mechanisms suggested by Luhmann (1979), Gefen (2000) found that the trust concept also applies to e-commerce and that trust in the e-vendor presented a positive effect on purchase intentions. The author argued that such an effect is possible because trust reduces consumers’ perceived risk of being mistreated by the e-store (Anderson & Weitz, 1989), and this low perception of risk, in turn, influences consumers’ online shopping behavior. Hence, a relationship between trust and perceived risk is hypothesized.

**H4:** Higher consumer trust in an Internet store will reduce the perceived risk of shopping through that store.

**Domain-Specific Innovativeness:** Consumer researchers viewed innovativeness as an individual’s tendency to adopt some objects or ideas that were new in the context of their individual experience (Hirschman, 1980). According to Gatignon and Roberston (1985), consumer innovativeness is domain or product specific which was defined as an individual’s tendency to learn about and adopt innovations (new products) within a specific domain of interest. Based on the finding that a domain-specific measure of innovation has been found to be an indicator of an individual’s adoption of Internet shopping (Citrin, Sprott, Silverman, & Stem, 2000), the following hypothesis is suggested:

**H5:** Increases in domain-specific innovativeness will result in decreases in perceived risk on Internet shopping.

**Internet Purchase Intention:** Perceived risk toward a product category has been shown to be negatively associated with purchase intentions toward that product category (Shimp and Bearden, 1982; White and Truly, 1989). Similar logic should hold true for perceived risk toward a particular channel. Thus, consumers who perceived fewer risks toward the Internet channel are expected to have stronger purchase intention toward Internet shopping.

**H6:** The perceived risk of Internet shopping is negatively related to purchase intention toward Internet shopping.

**RESEARCH METHODOLOGY**

**Step One: PRIS Construct Domain Specification**

The extant academic literature about perceived risk on shopping behavior either in the traditional or Internet context was consulted. In addition, some informal opinions, experiences, and concerns pertaining to internet mechanisms were extracted from popular sources, such as magazines, to better articulate the perceived risk construct due to specific characteristics of internet shopping. Eight domains of perceived risk on Internet shopping include: (1) financial risk, (2) product performance risk, (3) physical risk, (4) psychological risk, (5) social risk, (6) time/convenience risk, (7) privacy risk, and (8) security risk.
Step Two: Item Generation and Content/Face Validity Check

A set of items representing various facets of the eight perceived risk dimensions was generated to form the initial item pool for the PRIS instrument. In addition, several interviews and a focus group discussion were conducted to completely cover all possibilities. In all, 57 scale items were selected. Each item was recast into two statements according to our definition of perceived risk – one to measure the possibility of loss and another to measure the importance of this loss if a loss occurred while shopping online. A 7-point bipolar scale with a range from “extremely unlikely” (“1”) to “extremely likely” (“7”) was used to measure the probability component of the risk, and the importance component of risk was measured on a similar scale with a range from “extremely unimportant (“1”)” to “extremely important” (“7”).

The initial 57-item questionnaire was first edited by a professional editor for wording, understanding, and description. Then, this 57-item list and the definition of the construct were given to five judges who used both qualitative and quantitative procedures to assess the items for representativeness. The judges were asked to rate each of the items as either “not at all representative,” “somewhat representative,” or “clearly representative” of the definition provided. The judges were also asked to modify the wording of items so that they were at least somewhat descriptive of the construct. An interrater reliability coefficient (IR) was calculated. The formula used was a variation of Cohen’s kappa, where the coefficient ranged from a low of zero to a high of one (Perreault & Leigh, 1989).

\[
IR = \left\langle \frac{(F/N) - (1/k)}{k/(k-1)} \right\rangle^{0.5}
\]

Where IR: the interrater reliability coefficient.

F: the absolute level of observed agreement among all judges for each item placed in the same category.

N: the total number of item judges.

k: the number of coding categories.

The interrater reliability is considered low if IR is less than 0.8 and is considered high if IR is greater than 0.9 (Perreault & Leigh, 1989). In this study, the items with IR below 0.84 were deleted. An IR of 0.84 meant that four out of five judges classified the items as the same and rated them at least somewhat representative of the construct definition (Netemeyer et al., 1996). Eight items with low interrater reliability coefficients were removed and one item was reworded to avoid confusion in this content/face validity assessment, leaving 49 items for the pilot testing.

Step Three: Pilot Testing

The 49 items remaining from the content/face validity check were interspersed throughout a questionnaire and administered to a convenience sample of 308 consumers who have computer and Internet experience. The subjects were told that their participation was voluntary and their responses were anonymous and unidentifiable. Among 308 administered samples, 276 were complete and 32 incomplete, yielding a response rate of 89.6%.

Procedures and Results of Pilot Testing: The items representing eight respective domains were purified initially for internal consistency and inter-correlations with other items. The procedure began with the computation of coefficient alpha (Cronbach, 1951) separately for the eight dimensions to ascertain the internal consistency of items making up each dimension. This computation was followed by the principal component analysis for the scale.

To operationalize the survey questions, the linguistic terms of “extremely unlikely” and “extremely unimportant” were converted to “1” and “extremely likely” and “extremely important” to “7.” The raw data used to compute the coefficient alpha was in the form of a single value, or the converted number on
the possibility of the loss event (1-7) times the converted number on the importance of this loss (1-7). To avoid the nonlinear problem resulting from the multiplication, the multiplicative combination of these two components were operated as

$$\log(XY) = \log X + \log Y.$$  

In the beginning round of computation, the values of Cronbach alpha ranged from 0.40 to 0.86 across the eight dimensions of PRIS. The principal component analysis did not extract reasonable factors with explainable loadings in each factor. The computed values suggested that the deletion of some items would improve the alpha values and dimensionality.

An item’s corrected item-to-total correlation (that is, the correlation between the score on the item and the sum of scores on all other items making up the dimension to which the item was assigned) was run and plotted in descending order for each dimension. Items with low correlations ($r < 0.50$) and/or those whose correlations produced a sharp drop in the plot pattern were discarded. Other attributes for the selection of items included a high variance and a low mean (DeVellis, 2003, Hassan et al., 2006). Alpha values and new corrected item-to-total correlations were recomputed for the reduced sets of statements leading to further deletion of items and the improvement of the corresponding alpha values. This iterative sequence of computing Cronbach alpha and item-to-total correlations, followed by deleting the items, was repeated three times and resulted in a set of five items for financial risk, six items for product performance risk, two items for psychological risk, seven items for time/convenience risk, seven items for privacy risk, and three items for security risk, with alpha values ranging from 0.57 to 0.90.

The next step was to examine the dimensionality of the scale. The assumption of a normal distribution was tested and satisfied before the analysis was conducted. Principal component analysis was used, followed by a Varimax rotation with the scree test criterion to identify the number of dimensions of the scales. The PCA showed that five components with greater than one Eigenvalue existed in this PRIS pilot testing; however, some items with low factor loadings and high cross-loadings loaded on more than two components are suggested to be candidates for elimination.

RESULTS

After the first item purification process of pilot testing, the purified 30-item instrument was subjected to further data collection and refinement.

Step Four: Data Collection and Measure Purification

Because this study focuses on online shopping behavior, including Internet purchasing and browsing behaviors, the respondents were qualified based on whether (1) they had access to the Internet, (2) used the Internet for browsing, and (3) had experience searching online for product information. Internet non-users were not included in this study because of their possible lack of knowledge about the Internet mechanism. The subjects were obtained from a national sample of an email address database that provided a representative sample of current online users. The data was gathered from a web-based survey containing an introduction page that briefly described the research followed by the refined perceived risk items, Internet-related usage, and demographics items.

Two thousand five hundred invitation letters for the web-based survey were mailed. Three hundred forty-six individuals responded to the web-based survey. Among the responses, 77 were incomplete, leaving 269 complete samples and a return rate of 10.76% for this stage of data collection.
Measure Purification: A major objective of this stage was to delete some items and evaluate the robustness of the tentative 30-item PRIS scale. The purification was processed again by the evaluation of internal consistency, item analysis, and principal component analysis. Using the same operation as before, the raw data was transformed to Log (X×Y) = Log X + LogY to avoid the nonlinear combination of the data.

The computation of coefficient alpha and item-to-total correlations was alternated. Again, items with low correlations were removed, leading to 16 items for exploratory factor analysis. The principal component analysis was employed and showed clear and explainable factor loadings on the four dimensions of financial risk, product performance risk, time/convenience risk, and privacy/security risk. The factor loadings ranged from 0.50 to 0.84, with cross-loadings less than 0.33 and communality higher than 0.52.

After the exploratory phase, the next step is to conduct a confirmatory factor analysis to verify its structure of the PRIS. Using structural equation modeling (Jöreskog et al., 2000), the confirmatory factor analysis model was tested to verify the relationship between observable variables and latent variables.

Figure 1 illustrates the results from LISREL 8.54. The $\chi^2$ statistic was non-significant for the overall model, indicating an adequate fit for the confirmatory model of the data ($\chi^2 = 120.70$, $df = 87$, $p = 0.00982$). The plot of the normalized residuals presents an approximation to a straight line, suggesting that there are no departures from normality in the data nor any specification errors. The goodness-of-fit index (GFI) is 0.95, the root mean square error of approximation (RMSEA) is 0.038, the adjusted goodness-of-fit index (AGFI) is 0.92, and the normed fit index (NFI) is 0.97, verifying the good fit of data to the hypothesized model. With the criteria based on “rules of thumb” and empirical research (GFI and AGFI > 0.90, RMSEA < 0.08, CFI > 0.90 and NNFI > 0.95) (Guarino, Shannon & Ross, 2001; Netemeyer et al., 2003), the results indicated that the four-factor model of Internet shopping perceived risk was well-fitting.

![Figure 1: Confirmatory Factor Analysis Model for the Four Dimensions of the PRIS](image_url)
Step Five: Reliability Assessment

Reliability was to determine the internal consistency by assessing coefficient alpha and composite reliability. Composite reliability was calculated as follows (Fornell & Larcker, 1981; Hair, Anderson, Tatham & Black, 1998):

\[
\frac{\left(\sum \lambda_i \right)^2}{\left(\sum \lambda_i \right)^2 + \sum \delta_i}
\]

Where \( \lambda_i \) = the completely standardized loading for the \( i \)th indicator,

\( V(\delta_i) \) = variance of the error term for the \( i \)th indicator, and

\( P \) = the number of indicators.

The composite reliability was calculated from LISREL, and the thresholds for it have been advocated as 0.70 by Hair et al. (1998) and as 0.60 by Bagozzi and Yi (1988). The composite reliability of four factors ranges from 0.70 to 0.87 (CRFR=0.70, CRPPR=0.81, CRTCR=0.71, CRPRISER=0.87), supporting the case for scale reliability of PRIS measures. In addition, the construct was re-examined for each of the retained factors of the PRIS scale through confirmatory factor analysis (CFA). The findings from structural equation modeling (Figure 1) also support scale reliability.

Step Six: Validity Assessment

Peter (1981, p.134) defined construct validity as “the degree to which a measure assesses the construct it is purported to assess.” In this study, the construct validity of PRIS scale was examined by assessing convergent, discriminant, and nomological validity. Convergent and discriminant validity was examined by confirmatory factor analysis. A nomological net was established to assess nomological validity by using Pearson Product Moment Correlations.

Convergent Validity: Convergent validity refers to the degree of agreement in two or more measures of the same construct. Anderson and Gerbing (1988) suggested that evidence of convergent validity exists if all observable indicators (questionnaire items) load significantly on their respective latent variables. All loadings range from 0.65 to 0.81 (Figure 1), falling within Bagozzi and Yi’s (1988) suggested range of between 0.60 and 0.90. Given the loading range, you are convinced that the scales for these four dimensions of PRIS possess convergent validity.

Discriminant Validity: Discriminant validity indicates the degree to which measures of conceptually distinct constructs differ. It was assessed by the low factor loadings between items and unintended constructs and the examination of the correlations among the factors (Forsythe et al., 2006). All factor loadings between items and unintended constructs were less than 0.33, supporting the discriminant validity (Table 1). The correlations among the four constructs ranged from 0.55 to 0.76 (Figure 1). Researchers recommended that constructs not too highly correlated demonstrate discriminant validity (Byrne, 2001; Tabachnick & Fidell, 2001). Kline (1998) offered a criterion of \( r < 0.85 \) as indicative of discriminant validity. The low cross-loadings and all observed correlations among the constructs meet the conditions to demonstrate discriminant validity.

Nomological Validity: Nomological validity shows the ability of a scale to behave as expected with respect to some other constructs to which it is related (Churchill, 1995). A nomological net consisting of Internet familiarity, Internet experience, prior remote shopping behavior, trust in e-store, consumer innovativeness, and purchase intention was presented. It is hypothesized that Internet familiarity, Internet experience, prior remote shopping behavior, trust in e-store, and consumer innovativeness are negatively correlated with overall perceived risk; overall perceived risk is also negatively associated with online purchase intention.
Measures for Nomological Validity Check: Nunnally (1978) recommended that a separate sample be used to validate the scale. The third set of samples was also obtained from a national sample of an email address database through a web-based survey. The web-based survey contained a cover page describing the research purpose, multi-item scales of nomological-net variables, and the demographic items. Three thousand email invitations for the survey were sent and 536 were returned. Among them, 229 were complete, yielding a response rate of 7.63% for this third sample collection.

Familiarity with and Knowledge of Internet and Computer Technology Familiarity with and knowledge of Internet and computer technology was measured by a computer-literacy index (alpha = 0.900) introduced by Swinyard and Smith (2003). Some items were modified to meet the new Internet and computer technology. Cronbach’s alpha, item-to-total correlation, and exploratory factor analysis were conducted to validate the items’ internal consistency and dimensionality. The low item-to-total correlations (<0.50) and the existence of more than one factor in the factor analysis indicated that all items were not loaded on one factor and that some items should be deleted. The iterative sequence of computing alphas and item-to-total correlations followed by item deletion was repeated two times resulting in six items all loaded in one factor. Factor loadings ranged from 0.78 to 0.88 with a construct alpha value of 0.9182 (Table 2).

| Table 1: PRIS Scale Items with Factor Loadings and Cross-Loadings |
|------------------------|----------------|----------------|----------------|
| Items                  | Factor1 | Factor2 | Factor3 | Factor4 |
| FR3 Higher cost due to hidden fees | 0.1202 0.1625 0.2126 | 0.7108 |
| FR5 Costs more to return an unsatisfactory product | 0.2048 0.1164 0.1600 0.6705 |
| FR8 The price is inflated under the promise of free shipping | 0.1188 0.2680 0.1894 0.6696 |
| PPR10 The product does not perform as expected | 0.2871 0.2840 0.5072 0.3281 |
| PPR12 Unable to accurately judge product quality | 0.2364 0.1995 0.7098 0.2609 |
| PPR13 Do not have opportunities to touch/handle or try on the product | 0.1896 0.2033 0.8275 0.1110 |
| PPR15 Have limited information about the seller | 0.1677 0.1786 0.7455 0.2107 |
| TCR31 Difficulty submitting order | 0.1247 0.8185 0.1705 0.1871 |
| TCR33 Wait for delivery of product | 0.2591 0.7397 0.1493 0.1404 |
| TCR36 Online searches can return so many hits that are false or misleading | 0.1778 0.6662 0.2116 0.1789 |
| TCR37 Your item is out of stock | 0.1642 0.7928 0.1905 0.1553 |
| PRIV41 Your shopping habits and purchasing behaviors are tracked | 0.6725 0.2769 0.2774 0.0673 |
| PRIV43 You are contacted by companies without your consent | 0.7009 0.2889 0.2251 -0.0590 |
| SER47 Personal information is accessed | 0.8352 0.0767 0.1438 0.3890 |
| SER48 Credit information is accessed | 0.8430 0.1627 0.1093 0.1890 |
| SER49 Vendor’s computer is attacked | 0.6929 0.1143 0.1561 0.2641 |

Internet Experience Internet experience was measured from the following two perspectives: (1) the duration of the experience (i.e., the elapsed time since a consumer first had regular access to the Internet), and (2) the frequency of use (i.e., the consumer’s Internet usage rate) (Miyazaki & Fernandez, 2001). Experience duration was measured by asking how long (in years and months) respondents have had regular access to the Internet. Experience frequency was measured by asking respondents the number of hours per week that they use a browser to access World Wide Web pages and the number of hours per week that they send and/or read e-mail messages.

In the exploratory factor analysis, the first item of experience duration showed a very low loading (0.055) toward one dimension. Meanwhile, the other two items presented comparatively high loadings of 0.61 and 0.80, respectively. The deletion of the duration item is needed and is a logical action because computers and the Internet are so popular nowadays that people can begin their Internet experience at
young ages and also because computer/Internet technology changes rapidly. The elapsed time since a consumer first had regular access to the Internet is not a significant factor in differentiating people’s Internet experience. After the first item was discarded, the factor loadings were raised to 0.70 with an alpha value of 0.60.

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<th>Table 2: Computer-Literacy Index with Factor Loadings and Alpha Values</th>
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Prior Remote Shopping Behavior Prior remote shopping behavior was assessed with the following three items: “How many times did you make a purchase using a toll-free phone number?”, “How many times did you make a purchase through the mail?” and “How many times did you make a purchase through the TV?” (Miyazaki & Fernandez’s study, 2001). The three factor loadings are all larger than 0.63, verifying the representation of the three items for prior remote shopping behavior. A coefficient alpha at 0.7715 supports the internal consistency and construct reliability (Table 3).

<table>
<thead>
<tr>
<th>Table 3: Prior Remote Shopping Behavior with Factor Loadings and Alpha Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Items</td>
</tr>
<tr>
<td>IPI1</td>
</tr>
<tr>
<td>IPI2</td>
</tr>
<tr>
<td>IPI3</td>
</tr>
<tr>
<td>Entire set of alpha value</td>
</tr>
</tbody>
</table>

Trust in e-Store Measures of e-store trust was based on the store trust scales from Jarvenpaa et al. (Cronbach’s alpha = 0.92) (2000). The psychometric properties of the final measures were first assessed by corrected item-to-total correlations and then by means of confirmatory factor analysis procedures. This process verified that all items loaded into only one dimension as well as by coefficient alpha (0.91), which supported internal consistency and dimensionality (Table 4).

<table>
<thead>
<tr>
<th>Table 4: Trust in e-Store Scale with Factor Loadings and Alpha Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Items</td>
</tr>
<tr>
<td>Trust1</td>
</tr>
<tr>
<td>Trust2</td>
</tr>
<tr>
<td>Trust3</td>
</tr>
<tr>
<td>Trust4</td>
</tr>
<tr>
<td>Trust5</td>
</tr>
<tr>
<td>Trust6</td>
</tr>
<tr>
<td>Trust7</td>
</tr>
<tr>
<td>Entire set of alpha value</td>
</tr>
</tbody>
</table>
**Domain-Specific Innovativeness: DSI** Consumers’ domain-specific innovativeness was measured by using a well-established scale that has been validated in a wide variety of studies (Cronbach’s alpha = 0.91) (Goldsmith & Hofacker, 1991). The scale was modified in this study to measure domain-specific innovativeness for Internet usage specifically (Citrin et al., 2000). Table 5 shows that the entire set of alpha value is at 0.9009. Item alpha values are all above 0.87 and factor loadings range from 0.6732 to 0.8948, demonstrating the consistency and dimensionality of the DSI scale. All six items from the previous study were retained in this study.

<table>
<thead>
<tr>
<th>Items</th>
<th>Reliability Coefficients</th>
<th>Factor Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSI1 In general, I am among the last in my circle of friends to visit a company’s new web site when it appears on the <a href="http://WWW">WWW</a>. (Reversed coded)</td>
<td>0.8807 0.8104</td>
<td></td>
</tr>
<tr>
<td>DSI2 If I heard that a new retail site was available on the Web, I would not be interested enough to shop from it. (Reversed coded)</td>
<td>0.8891 0.7298</td>
<td></td>
</tr>
<tr>
<td>DSI3 Compared to my friends, I seek out relatively little information over the <a href="http://WWW">WWW</a>. (Reversed coded)</td>
<td>0.8825 0.7802</td>
<td></td>
</tr>
<tr>
<td>DSI4 In general, I am the last in my circle of friends to know of any new retail Web sites. (Reversed coded)</td>
<td>0.8681 0.8948</td>
<td></td>
</tr>
<tr>
<td>DSI5 I will visit a new company’s Web site even if I have not heard of it before.</td>
<td>0.8827 0.7658</td>
<td></td>
</tr>
<tr>
<td>DSI6 I know about new retail Web sites before most other people in my circle do.</td>
<td>0.8958 0.6732</td>
<td></td>
</tr>
<tr>
<td>Entire set of alpha value</td>
<td>0.9009</td>
<td></td>
</tr>
</tbody>
</table>

**Internet Purchase Intention** Internet purchase intention was measured with 5 items used by Jarvenpaa et al. (2000) and Chiou et al. (2005). Low Cronbach’s alpha values and some low factor loadings in the first run implied that some items should be deleted. The corrected item-to-total correlations were computed and the results showed that the 4th and the 5th item presented low correlations to the sum of the other item scores (0.3867 and 0.4298). After discarding the last two Internet purchase intention items, the alpha values and new corrected item-to-total correlations were computed again resulting in high alpha values ranging from 0.79 to 0.89. The high factor loadings also pinpointed the three items that were loaded in one factor (Table 6).

<table>
<thead>
<tr>
<th>Items</th>
<th>Reliability Coefficients</th>
<th>Factor Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPI1 It is very likely that I would consider purchasing from an Internet store in the next 3 months.</td>
<td>0.8297 0.8588</td>
<td></td>
</tr>
<tr>
<td>IPI2 It is very likely that I would consider purchasing from an Internet store in the next year.</td>
<td>0.7906 0.9369</td>
<td></td>
</tr>
<tr>
<td>IPI3 I will purchase a product on the Internet when it is available.</td>
<td>0.8888 0.7613</td>
<td></td>
</tr>
<tr>
<td>Entire set of alpha value</td>
<td>0.8845</td>
<td></td>
</tr>
</tbody>
</table>

**Hypotheses Testing** The hypotheses in checking nomological validity was tested by relating the scores on overall perceived risk to familiarity with and knowledge of Internet and computer technology, Internet experience, prior remote shopping behavior, trust in e-store and domain-specific innovativeness. This was followed by a relationship check between overall perceived risk (PRIS) and purchase intention.

All the validation measures were summed to a single score. Pearson Product moment correlations were determined to be an appropriate tool for the assessment of the nomological validity in this case.
Figure 2 shows the correlation coefficients for these analyses.

All the hypotheses were supported at the level of $p < 0.05$ and followed the expected direction. The pattern of the correlations among familiarity with and knowledge of Internet and computer technology, Internet experience, prior remote shopping behavior, trust in e-store, and domain-specific innovativeness to overall perceived risk or PRIS (H1-H5) presents a negative relationship, meaning that if consumer A is more familiar with Internet and computer technology, has more Internet experience, has more previous experience shopping by telephone, mail and TV, more trust in e-store, and is more innovative in the online shopping environment than consumer B, consumer A will perceive a lower risk for online shopping. Also, consumers who perceive a lower online shopping risk will purchase more products in the future from the Internet than those who perceive that Internet shopping poses greater risks (H6).

![Figure 2: Correlations of Perceived Risk Model for Nomological Validity Check](image)

**DISCUSSION AND CONCLUSIONS**

The results from three different sample sets, including Internet browsers and users, supported the proposed measures of perceived risks associated with online shopping in terms of construct, discriminant, convergent, and nomological validity. More specifically, internal consistency analysis, item analysis, and exploratory and confirmatory factor analysis supported the construct of the four dimensions of perceived risk, financial risk, product performance risk, time/convenience risk, and privacy/security risk.

The PRIS scale demonstrated clear construct validity. Specifically, nomological net was supported in that correlations between familiarity with and knowledge of Internet and computer technology, Internet experience, prior remote shopping behavior, trust in e-store, domain-specific innovativeness, and perceived risk of Internet shopping were negatively correlated. The shoppers who perceived more online shopping risk have lower intention to purchase online in the future than those who reported less risk perception.
In conclusion, the scale developed here could provide academic researchers with a reliable and valid tool to examine online shopping behavior, offer Internet retailers shopping information regarding risk perception, and guide future business strategies.

Limitations

This PRIS scale was developed specifically for the Internet shopping environment, therefore, this scale must be used with caution if applied to other shopping contexts. Given the pace of Internet and computer technology evolution, researchers must consider how the nature of these changes might redefine aspects of the risks of Internet shopping.

The dimensions of risk perception have been formulated without consideration of what might be the special nature of risk in purchasing on the Internet. Internet scams are not common but they are not extremely rare. The increasing prevalence of shopping on the Internet means that these scams will become more and more common (Gil, 2012; Better Business Bureau, 2012). The coming widespread recognition of these scams means that consumers may become very skeptical of vendors they don’t know and even vendors that they know and scam artists masquerading as known vendors. This makes it more difficult for consumers to assess the risk of Internet shopping. It may be that this area of Internet risk is already accounted for in the dimensions of risk defined by PRIS. Yet without including Internet scam site risk into the eight domains of risk perception we limit our understanding of perceived risk of internet shopping. There is a research study that needs to be completed looking at this issue.

Directions for Future Research

One focus for future research can be done to replicate the scale development by using sampling populations from different countries, such as from China. Surrounded by a different culture, a different political system, and different Internet regulations, Chinese online shoppers may present a distinctive perspective on perceived risk towards online shopping. Also, within the multi-cultural society of the United States of America, representative samples could be drawn from various culture backgrounds to assess cultural influence on perceived risk toward online shopping.

Vendor risk could become a research topic to broaden the view and scope of the risk perceived by the internet shoppers in the shopping context. Researchers may want to study if there is more risk with some vendor types than others. This study focused on purchasing tangible products from internet. Consumer’s perceived risk of purchasing service online, such as e-banking or professional tax service, is also a valuable research area for further examination.

REFERENCES


