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Concerns About Payment Security of Internet Purchases: A Perspective on Current On-Line Shoppers

Kyoung-Nan Kwon
Jinkook Lee

Abstract

Consumers' concerns about payment security have been recognized as an obstacle to the growth of Internet shopping. The purpose of our study was to investigate the influence of payment security concerns on Internet purchases. We proposed that consumers' concerns about payment security mediate the relationship between attitude toward Internet shopping and actual purchases. Using data from the Georgia Institute of Technology Graphics Visualization and Usability Center's 10th WWW User Survey, we found empirical evidence supporting the mediating relationship. Attitude toward Internet shopping was found to be negatively related to security concerns, and security concerns were found to be negatively related to Internet purchases. Furthermore, it was found that providing alternative off-line payment methods reduces security concerns and therefore promotes on-line purchases. Limitations on generalizing the findings were discussed.

Kwon, K-N, & Lee, J. (2003). Concerns about payment security of internet purchases: A perspective on current on-line shoppers. *Clothing and Textiles Research Journal*, 21(4), 174-184. *Key Words*: attitude, payment security, and Internet shopping.

Internet purchasing is growing exponentially. Nielson/NetRatings (2002) reported a 44% increase in sales from 2000, with total sales reaching \$59 billion in 2001. Apparel has been considered as the least likely product to be purchased on-line, since consumers cannot try on apparel or evaluate quality on-line (Harmon, 1998; "Internet Apparel Sales," 1999). However, consumers have proved this skepticism unfounded, as Internet sales in apparel have continued to increase over the past years. On-line apparel sales hit \$1.1 billion in 1999, which is roughly twice that of 1998 (Ebenkamp, 2000). Jupiter Communications anticipates that by 2003, U.S. on-line clothing sales will amount to \$6.7 billion (Arlen, 2000). According to a recent survey by Nielsen/NetRatings (2002), sales of apparel were second only to travel services in both 2000 and 2001. Interestingly, consumer on-line spending on apparel was even higher than expenditures on computer hardware and software. The Internet has become a main shopping medium for apparel, despite the consumer's difficulties in product evaluation.

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However, significant obstacles prevent the expansion of e-tailing, most of which involve consumers' concerns about the security of Internet purchases (Hoffman, Novak, & Chatterjee, 1995; Light, 2001; Stahl, 2002). The security issue has been widely discussed by all constituencies, including the Internet retail industry, policy makers, and consumer advocates. The Internet retail industry has introduced various methods such as encryption technologies and off-line payment arrangements, as well as the launching of an industry-wide anti-fraud initiative (Douglas, 2000; Hartnett, 2000; Linville, 2000). Alarmed by the increasing number of on-line fraud cases such as stolen credit card numbers and identity theft, consumer advocates have begun educating consumers about security issues of on-line shopping (National Consumer League, 2001; Neeley, 2000). In the policy arena, security issues and consumer protection needs have become the center of debate, and the discussion has moved toward legislative actions (Federal Trade Commission, 2000; Smith et al., 1998; U.S. Department of Justice, 2001).

Perceived risk influences consumers' product purchases and their choice of retailers (Darden & Dorsch, 1990; Dowling, 1986; Summers & Wozniak, 1990), especially when consumers are using non-traditional retail formats such as telephone or mail-order (Cox & Rich, 1964; Eastlick & Feinberg, 1995; Festervand, Snyder, & Tsalikis, 1986; Kwon, Paek, & Arzeni, 1991; Schiffman, Schus, & Winer,

1976; Spence, Engel, & Blackwell, 1970). Several researchers have discussed the adverse influence of the general risk perception of on-line shopping (e.g., Jarvenpaa et al., 1999; Miyazaki & Fernandez, 2001; Swaminathan, Lepkowska-White, & Rao, 1999). Risk perceptions of on-line shopping can include various issues such as privacy protection, on-line payment security, trustworthiness of Internet retailers, and the intangible nature of on-line shopping—the customer's inability to touch, feel, and handle the items to be purchased. Several industry surveys (e.g., "Internet shopping," 1998; "Net nightmares thwart potential," 1998; Newmann, 1999; Ray, 2001) reported that the key reason why Internet users do not purchase products via the Internet is their concern that their credit card information is not secure. However, little academic research has been done to investigate the influence of payment security concerns on Internet purchase behavior.

The purpose of our study was to examine the influence of consumers' concerns about on-line payment security for Internet purchases, especially if this security concern mediated the relationship between consumers' attitude toward Internet shopping and actual purchases. Based on the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), attitude toward Internet shopping was expected to predict actual purchases. We hypothesized that this relationship was influenced by payment security concerns. Further, our study investigated whether consumers' security concerns could be altered by providing additional shopping benefits such as low prices and better quality, or by introducing other payment options. Our results provide practical guidance for the Internet industry on how to overcome consumers' security concerns in order to facilitate Internet purchases.

Literature Review

On-line Payment Security

The reluctance to use credit cards for on-line purchases is one of the primary obstacles to the future growth of Internet shopping ("Building Consumer Trust Online," 1999; Hoffman et al., 1995; Light, 2001; Stahl, 2002; Stewart, 1999). A U.K. Web survey found that 80% of U.K. Internet users had never purchased a product on-line, due in part to their fears about on-line payment security ("Net nightmares thwart potential," 1998). Similarly, Ernst & Young's Survey of Shopping and Selling Plans for the Internet reported that 68% of consumers who had not yet made an Internet purchase felt uncomfortable sending their credit card number across the Internet ("Internet shopping," 1998). Furthermore, a study by the Center for Trust Online found that about half of U.S. Internet users who had not purchased over the Internet indicated on-line payment security issues as the major reason for their unwillingness to make on-line purchases (Newmann, 1999).

Concern about payment security is the reason not only for consumers not to purchase on-line, but also for existing shoppers to discontinue purchasing over the Internet. Using panel data at two points in time, 1997 and 1999, Lohse,

Belleman, and Johnson (2000) categorized on-line buyers' behavior into four segments: "never buy," "dropouts," "newbie," and "steadfast buyers." The two groups, "never buy," who had not made a purchase on the Internet in either time period, and "dropouts," who made an on-line purchase in 1997 but did not do so in 1998, had more concerns about on-line payment security than the current Internet shopper groups at the time, the "newbie" and the "steadfast buyers." The first two groups were more likely to be concerned about on-line monitoring and were also reluctant to give phone numbers on-line.

Although on-line payment security is the major issue in practice, few researchers have gone beyond reporting descriptive statistics. Several researchers have discussed the adverse influence of the general risk perception of on-line shopping (e.g., Jarvenpaa et al., 1999; Miyazaki & Fernandez, 2001; Swaminathan, Lepkowska-White, & Rao, 1999), but few studies have specifically examined the impact of the payment security concern on actual purchase behavior.

Attitude, Payment Security, and Purchase

According to the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), one of the predictors of intention to engage in a certain behavior is attitude toward the behavior.¹ Attitude toward the behavior is based on the sum of consumer beliefs regarding the behavior's attributes weighted by evaluation of these attributes. Thus, attitude can be described as

$$\text{Attitude} = \sum e_i b_i$$

where e_i represents evaluations of the consequences of a particular behavior and b_i represents cognitive beliefs about the behavior. This model is called an "expectance-value model."

The overall attitude is an antecedent of the intention to engage in the behavior. The intention predicts the behavior, unless intent changes prior to the behavior, or unless one uses particularly different criteria to form the intention and to engage in the behavior. This model has received support in various academic disciplines (Sheppard, Hartwick, & Warshaw, 1988). In consumer behavior literature, attitude measured by multi-attributes was used to predict the purchase behavior for specific products (e.g., apparel in Chang, Burns, & Noel, 1996), as well as to predict non-consumption behavior (e.g., Zuckerman & Reis, 1978, for the donation of blood at campus drives; Patry & Pelletier, 2001, to predict the non-belief in the existence of UFOs). Attitude has also been found as an antecedent to retail patronage, including electronic shopping (Shim & Drake, 1990), shopping centers (Evans, Christiansen & Gill, 1996), and Internet shopping (Shim et al., 2001).

The literature suggests the positive relationship between attitude toward Internet shopping and Internet purchases. We expected the concerns about payment security to medi-

¹The full model of the theory of reasoned action explains that both attitude and perceived social norms toward the behavior predict behavioral intention.

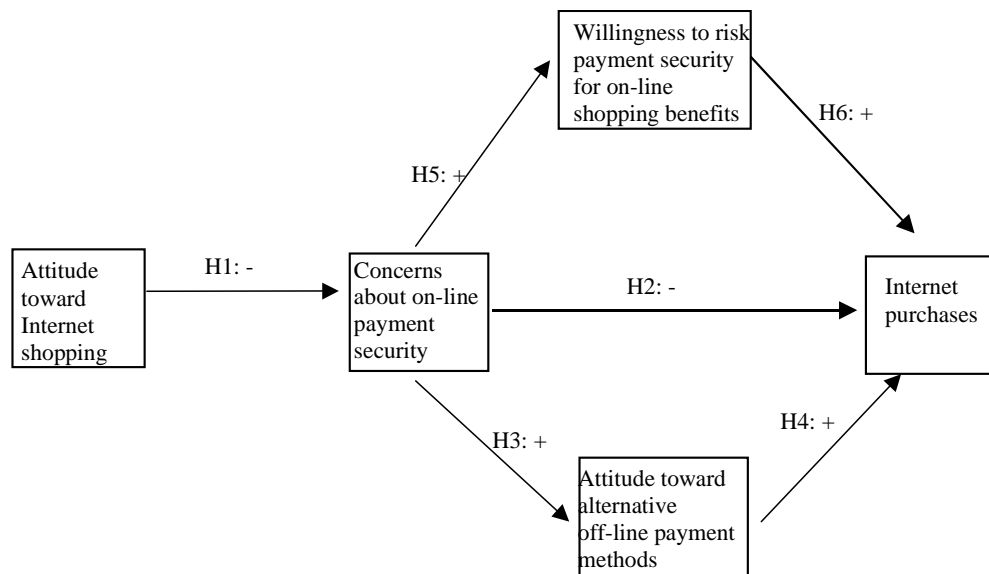


Figure 1. Proposed model: Consumer concerns about payment security of Internet purchases.

ate² the relationship between attitude and Internet purchases. Phelps, D’Souza, and Nowak (2001) found the mediating role of “privacy concern” in the effects of the attitude toward direct marketing on catalog purchase behavior. The attitude was identified as an antecedent of privacy concern, and the privacy concern was negatively related to the purchase behavior. Therefore, a mediating effect of security concerns in the relation between attitude toward Internet shopping and purchases was proposed.

Hypothesis 1: The more favorable a consumer’s attitude toward Internet shopping, the less concerned he or she is about payment security.

Hypothesis 2: The more concerned a consumer is about payment security, the less she or he makes Internet purchases.

Retailers’ Coping Strategies for Consumer Payment Security Concerns

Another research question raised was whether any negative influence of payment security concerns can be altered to promote Internet purchases. Internet retailers have both explicitly and implicitly addressed consumer concerns about payment security. Explicitly, Internet retailers provide various services to reduce security concerns. The services include the provision of off-line payment methods such as telephone and fax, setting up off-line accounts, and providing information on how these transactions are secured by encryption technologies (Dougas, 2000; Hartnett, 2000; Linville, 2000). Based on these services, the following hypotheses were proposed.

Hypothesis 3: Consumers who are concerned about payment security on the Internet favor the use of alternative off-line payment methods more than those who are unconcerned.

Hypothesis 4: A favorable attitude toward off-line payment methods increases Internet purchases.

Another way to cope with the payment security issue is to provide consumers with sufficient reasons to purchase regardless of their security concern. Consumers who are concerned about payment security would shop on-line for the benefits that Internet shopping provides which include low price, convenience, quality, and merchandise variety. For instance, one might say, “I would give out my credit card number if the deal were really good, although I am still worried about on-line payment security.” We call this concept “willingness to risk payment security,” and it is expected to influence consumers’ decision to make Internet purchases. On-line retailers would be interested to learn whether shopping benefits can offset security concerns associated with Internet shopping and consequently, increase purchases on-line. Thus, the following two hypotheses were proposed.

Hypothesis 5: Providing on-line shopping benefits will encourage consumers who are concerned about on-line payment security to be willing to risk payment security.

Hypothesis 6: Consumers who are willing to risk payment security for on-line shopping benefits are more likely to purchase on the Internet.

Mick and Fournier (1998) investigated how consumers deal with the stress and anxiety associated with using technologies and found an array of coping strategies ranging from confrontation to avoidance. Within the context of consumers’ privacy concerns, Sheehan (1999) found the utilization of both the avoidance strategy (e.g., request re-

²The mediating role refers to “the generative mechanism through which the focal independent variable is able to influence the dependent variable of interest” (Baron & Kenny, 1986).

removal from mailing lists) and the confrontation strategy (e.g., send a "flame" message to those sending unsolicited e-mail) among those who have privacy concerns. The provision of additional security services such as off-line payment options and encryption technologies can assist consumers directly to cope with their security concerns. However, the provision of additional shopping benefits such as low price and high quality might not directly help consumers deal with the stress and anxiety associated with the payment security. Therefore, the explicit services are expected to be more effective than the implicit approach. See Figure 1 for a model of the hypothesized relationships.

Methods

Data

Data collected by the Georgia Institute of Technology Graphics Visualization and Usability (GVU) Center's 10th WWW User Survey were used in our study. Because GVU conducts the surveys as a public service, the data are available on-line (http://www.gvu.gatech.edu/user_surveys/survey-1998-10). The 10th Survey was conducted from October 10, 1998, through December 15, 1998. Of 645 survey participants, 591 completed the survey, and their responses were used in our study. The majority of the participants (536) included in our study indicated that they had purchased consumer products such as apparel, shoes, computer software, music CDs, and other items over the Internet.

The GVU's WWW User Survey was conducted over the Web, where participants responded to posted questionnaires. Participants were solicited through announcements on Internet-related newsgroups, the WWW-surveying mailing list, popular media, banners randomly rotated through high-exposure sites and advertising networks, and the GVU's WWW User Surveys' list of people interested in the surveys (Kehoe, Pitkow, Sutton, Aggarwal, & Rogers, 1999). Thus, their self-selection bias as well as characteristics of the survey participants regarding computer and Internet experiences and demographics limits the generalizability of our findings. This limitation is discussed later in the "Profiles of the Sample" section.

Measures

The models tested included the following constructs. Each construct was operationalized by using questions from the GVU's WWW Used Surveys. All the questions used are shown in Table 1.

Attitude toward Internet shopping. Attitude toward Internet shopping was computed for each attribute based on the expectancy-value model (i.e., attitude on each attribute = $e_i b_i$; overall attitude = $\sum e_i b_i$, where " e_i " represents the importance assigned each attribute of shopping and " b_i " represents the belief that Internet shopping offers each attribute). Under this model, the individual's evaluation of each attribute was weighted by his or her belief that Internet retailers would provide that attribute. Subjects were asked to indicate on 5-point Likert scales (1 = strongly disagree to 5 = strongly agree) to what extent they agreed

with statements that Internet retailers provided certain attributes (b_i) and whether each attribute was important (e_i) to them when shopping or considering shopping on the Internet. A higher score on an attitude scale represents a favorable attitude toward Internet shopping.

Concerns about on-line payment security. The respondents were asked to state how strongly they agreed with the following three statements:

- "Providing credit card information through the Web is the single most important reason I don't buy through the Web more often,"
- "Providing credit card information through the Web is no riskier than providing it over the phone to an off-line vendor," and
- "It is just as safe to use credit cards when making purchases from WWW vendors (compared to traditional vendors)."

The responses were located on 5-point Likert scales (1 = strongly disagree to 5 = strongly agree).

Attitude toward alternative off-line payment methods. The respondents were asked to indicate how likely they were to buy a competitively priced product or service that they really wanted under the following two scenarios: "You provide credit card and purchase information through a toll call/fax," and "You provide credit card and purchase information through a toll-free call/fax." Responses were made on 5-point Likert scales (1 = very unlikely to 5 = very likely).

Willingness to risk payment security. To identify respondents' willingness to risk payment security when shopping-related benefits (i.e., better price and quality) are provided, the respondents were asked to indicate their level of agreement or disagreement with the following two statements: "I would be more willing to provide my credit card information through the Web if the prices were considerably lower," and "I would be more willing to provide my credit card information through the Web if the products/services were of a higher quality." Responses were recorded on 5-point Likert scales (1 = strongly disagree to 5 = strongly agree).

Internet purchases. Both the frequency and the dollar amount spent on Internet shopping were examined. Regarding the frequency, the respondents were asked how often they made on-line purchases from Web-based vendors. The possible responses ranged from "do not make online purchases at all" (= 1) to "purchase at least once each day" (= 7) on a 7-point scale. The respondents were also asked how much they spent during the past six months. The possible responses ranged from "less than \$50" (= 1) to "\$500 or more" (= 4) on a 4-point scale.

Results

Profiles of the Sample

The demographic profile of the sample is presented in Table 2. A significant portion of the sample held professional occupations, including 32% trained professionals, 8.8% consultants, and 19.1% in management positions. Since the survey was conducted over the Internet, the sample showed a high level of educational attainment. About 57.8%

Table 1. Measurement Scales

Latent Factors	Manifest Variables	Scale
Attitude toward Internet shopping	<p>On the whole, how well does each of the following statements characterize your opinion of commercial vendors on the Web compared to other, more traditional vendors?</p> <ul style="list-style-type: none"> • WWW vendors offer more useful information about the choices. • It is easier to place orders with WWW vendors. • It is easier to cancel orders placed with WWW vendors. • WWW vendors offer better prices • It is easier to contact WWW vendors. 	5-point scales anchored at "strongly disagree" and "strongly agree."
	<p>Now, please indicate which of the following features are MOST IMPORTANT to you personally, when shopping, or considering shopping, on the Web. (Please check all that apply)</p> <ul style="list-style-type: none"> • Quality of information about purchase choices • Ease of placing orders • Ease of canceling orders • Lowest price • Ease of contacting the vendor 	Dichotomous variables, yes / no.
Concerns about payment security	<p>Please indicate your agreement/disagreement with each of the following statements.</p> <ul style="list-style-type: none"> • Providing credit card information through the Web is the single most important reason I don't buy through the Web more often • Providing credit card information through the Web is no riskier than providing it over the phone to an offline vendor. <p>On the whole, how well does the following statement characterize your opinion of commercial vendors on the Web compared to other, more traditional vendors?</p> <ul style="list-style-type: none"> • It is just as safe to use credit cards when making purchases from WWW. 	5-point scales anchored at "strongly disagree" and "strongly agree."
Attitude toward alternative off-line payment methods	<p>For each scenario, please indicate how likely you are to buy a competitively priced product/service that you really wanted.</p> <ul style="list-style-type: none"> • You provide credit card and purchase information through a toll call/fax. • You provide credit card and purchase information through a toll-free call/fax. 	5-point scales anchored at "very unlikely" to "very likely."
Willingness to risk payment security	<p>Please indicate your agreement/disagreement with each of the following statements.</p> <ul style="list-style-type: none"> • I would be more willing to provide my credit card information through the Web if the prices were considerably lower. • I would be more willing to provide my credit card information through the Web if the products/services were of a higher quality. 	5-point scales anchored at "strongly disagree" and "strongly agree."
Internet purchases	<ul style="list-style-type: none"> • On average, how often do you make online purchases from Web-based vendors? (frequency) • What is the total amount you spent on purchases through vendors on the World Wide Web during the past six months? (spending) 	<p>Frequency: 7-point scale from "I do not do that at all" to "at least once each day."</p> <p>Spending: 4-point scale from "less than \$50" to "\$500 or more."</p>

of the respondents had a college degree or above, and additional 30.6% had some college education. There were more male participants than female, 68.5% and 31.5%, respectively. Most respondents were non-Hispanic whites living in the United States. Approximately one half of the survey participants were married; 31.8% were single. About 91% of the respondents were between 21 and 60 years old.

Statistics regarding respondents' use of computers and the Internet are shown in Table 3. Most respondents seemed to feel comfortable with using computers and the Internet. The majority of survey participants reported that they had spent more than \$100 on the Web in the past six months.

Regarding the frequency of purchasing on-line, about half of them reported shopping on-line at least once each month. The generalizability of the findings of our study is limited, since the sample characteristics are skewed to Caucasian male professionals with high education attainment who feel comfortable with computers and the Internet.

Factor Analysis

Before fitting a structural equation model to test the hypotheses, Principal Components Factor Analysis with Varimax rotation was conducted on the five attitude variables (refer to Table 1) to determine the structure of the

Table 2. Demographic Profiles of the Sample

	Frequency	Percentage		Frequency	Percentage
Occupation			Marital Status		
Upper management	44	7.5%	Not disclosed	9	1.5%
Trained professional	188	32.0%	Divorced	35	6.0%
Middle management	43	7.3%	Other	47	8.0%
Skilled labor	10	1.7%	Married	299	50.9%
Junior management	25	4.3%	Separated	6	1.0%
Consultant	52	8.8%	Single	187	31.8%
Administrative	20	3.4%	Widowed	5	.9%
Temporary	4	.7%	Total	588	100.0%
Support	32	5.4%	Household income		
Researcher	19	3.2%	Not disclosed	72	12.2%
Student	42	7.1%	Under \$10,000	11	1.9%
Self-employed	76	12.9%	\$10,000 - \$19,000	25	4.3%
Other	33	5.6%	\$20,000 - \$29,000	39	6.6%
Total	588	100.0%	\$30,000 - \$39,000	75	12.8%
Education attainment			\$40,000 - \$49,000	70	11.9%
Grammar school	2	.3%	\$50,000 - \$74,000	135	23.0%
High school	37	6.3%	\$75,000 - \$99,000	79	13.4%
Voc/tech	16	2.7%	Over \$100,000	52	13.9%
Some college education	164	27.9%	Total	588	100.0%
College	217	36.9%	Geographical location		
Masters	113	19.2%	Asia	5	.9%
Doctoral	19	3.2%	Oceania	13	2.2%
Professional	15	2.6%	Europe	48	8.2%
Other	5	.9%	USA	499	84.9%
Total	588	100.0%	Canada	20	3.4%
Gender			Mexico	1	.2%
Female	185	31.5%	Middle East	2	.3%
Male	403	68.5%	Total	588	100.0%
Total	588	100.0%	Age		
Race			11-20	24	4.1%
Not disclosed	21	3.6%	21-30	157	26.7%
White	529	90.0%	31-40	172	29.3%
Afro American	7	1.2%	41-50	132	22.4%
Indigenous	1	.2%	51-60	72	12.2%
Asian	13	2.2%	61-70	18	3.0%
Hispanic	4	.7%	71 and above	6	1.1%
Multiracial	9	1.5%	Not disclosed	7	1.2%
Other	4	.7%	Total	588	100.0%
Total	588	100.0%			

Note. The total number of subjects for each variable in Table 2 does not match with the size of the sample used in structural equation model fitting. The discrepancy represents non-responses in demographic and computer and Internet use questions.

attitude construct. The factor analysis revealed that four of the attitude items were loaded on one factor, which yielded an eigenvalue 1.85 (explained variance = 37.05%). In general, a factor with an eigenvalue greater than 1 is considered significant (Hair et al., 1998). The factor extracted included “offering useful information,” “ease of placing orders,” “ease of canceling orders,” and “ease of contacting Web retailers.” Rotated factor scores were .47, .54, .54, and .60, respectively. All four rotated factor loadings were greater than .40, indicating significance (Hair et al., 1998). The fifth item, “offering better price,” did not load properly on the factor as indicated by a low rotated factor score of .009. Therefore, a single factor containing four items was

retained for further structural model fitting.

Although this measure of attitude does not capture other important dimensions of sensory experience and merchandise quality, this empirical result is similar to Shim and her colleagues’ (2001) attitudinal factor. Shim et al. conceptualized attitude toward Web shopping as multidimensional—including transaction services, convenience, sensory experience, and merchandise. They found transaction services and convenience to be most dominating in the attitudinal factor solution. Given the primary objective of our study, which was to test the influence of security concerns, the incompleteness of the attitudinal measure was not a serious concern.

Table 3. Use of Computer and Internet of the Sample

	Frequency	Percentage
Comfort with computers		
Very comfortable	531	90.3%
Somewhat comfortable	50	8.5%
Neither	4	.7%
Somewhat uncomfortable	2	.3%
Very uncomfortable	1	.2%
Total	588	100.0%
Comfort with the Internet		
Very comfortable	517	87.9%
Somewhat comfortable	61	10.4%
Neither	7	1.2%
Somewhat uncomfortable	1	.2%
Very uncomfortable	2	.3%
Total	588	100.0%
Amount spent on		
Web in last 6 months		
Less than \$50	105	17.8%
\$50 - \$100	49	8.3%
\$100 - \$500	202	34.2%
\$500 or more	235	39.8%
Total	591	100.0%
Frequency of purchasing on-line		
Don't do it at all	55	9.3%
Do less than once a month	248	42.0%
Do about once a month	180	30.5%
Do several times a month	83	14.0%
Do about once a week	21	3.6%
Do several times a week	4	.7%
Total	591	100.0%

Note. The total number of subjects for each variable in Table 3 does not match with the size of the sample used in structural equation model fitting. The discrepancy represents non-responses in demographic and computer and Internet use questions.

Reliability and Validity

A confirmatory factor analysis was run for the measurement model including the five latent variables. Table 4 presents the results of the measurement model, including correlations among the latent variables, construct reliability, means, and standard deviations. Construct reliabilities³ for the five latent variables range from .60 through .87. The construct reliability is used in structural equation modeling

³Construct reliability was calculated as suggested by Hair et al. (1998) and Bagozzi and Yi (1988):

$$\text{Construct reliability} = \frac{\sum (\text{standardized loading})^2}{\sum (\text{standardized loading})^2 + \sum e_j}$$

⁴The chi-square statistic is sensitive to sample size and model complexity so that the rejection of a model based solely on the chi-square statistic is inappropriate (Bagozzi & Yi, 1988; Grewal, Monroe, & Krishnan, 1998).

to measure the degree to which a set of items (indicators or variables) share in their measurement of a construct (Hair et al., 1998). Bagozzi and Yi (1988) recommended .60 as a threshold value for acceptable reliability. Hair et al. (1998), on the other hand, suggested .70 as a threshold value, but indicated that values below .70 are acceptable if the research is exploratory in nature. Given the exploratory nature of this study and the fact that we used secondary data, the reliabilities of the constructs seem acceptable, although further development of more reliable scales is recommended.

Correlations between each latent variable are also reported in Table 4. Each latent variable was plausibly correlated with one or more of the other latent variables, which suggests construct validity (Ping, 1999). All the correlations in Table 4 were less than |.60|, which suggests discriminant validity.

Structural Model Results

AMOS version 4.0 was used for all the structural equation modeling analyses, using maximum likelihood estimation, which is an estimation method commonly employed in structural modeling (Hair et al., 1998). The results of the model fitting are shown in Table 5. The proposed model consists of one exogenous and four endogenous constructs, and six hypothesized relationships were fitted (see Figure 1). All indicators of each of the latent variables were loaded significantly at alpha less than .05. Model fit was examined based on the following goodness of fit criteria: Comparative Fit Index (CFI), Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), and Root Mean Square Error of Approximation (RMSEA). In general, above .9 for CFI, GFI, and AGFI and less than .1 for AGFI indicate a good model fit (Bagozzi & Yi, 1988; Hair et al., 1998; Loehlin, 1998). The model fitting revealed satisfactory results: CFI = .95, GFI = .96, AGFI = .93, and RMSEA = .06. The model also had a chi-square value of 16.01 (df = 59; p = .00)⁴, but the chi-square ratio value (χ^2/df) of 2.98 suggested a good model fit. Modification indices suggested an additional path from attitude toward Internet shopping to Internet purchases.

All relationships proposed were significant except the path between "willingness to risk payment security" and "Internet purchases" ($p = .25$). The insignificant path suggests that the construct of willingness to risk payment security is not related to on-line purchase. Therefore, the construct was dropped from the model. Consequently, the significant path between "concerns about on-line payment security" and "willingness to risk payment security" was also removed. Because the latent variable of "willingness to risk payment security" cannot predict the dependent variable of interest, "Internet purchases," no justification is present for the variable to remain in the model. After the construct was removed, the model was finalized (see Figure 2). After excluding "willingness to risk payment security" and including the new path between "attitude toward Internet shopping" and "Internet purchase," the final model was fitted. The final model still has an overall good fit. All CFI (.95), GFI (.97), AGFI (.93), and RMSEA (.06) values indicate an adequate model fit. Relationship estimates for the two model paths (hypotheses) and the associated t -values are provided in Table 5.

Table 4. Measurement Model Results

Latent Variables	Correlations				Construct Reliability	Mean	Std. Dev.
	1	2	3	4			
1. Attitude toward Internet shopping					.60	8.78	4.76
2. Concerns about payment security	-.39				.84	7.05	3.52
3. Willingness to risk payment security	.14	-.32			.86	6.04	2.43
4. Attitude toward alternative off-line payment methods	-.10	.089	-.09		.66	5.61	2.37
5. Internet purchases	.38	-.58	.13	.069	.75	5.59	1.87

Table 5. Testing the Model Relationships

From	To	Proposed Model (N = 591)		Final Model (N = 591)	
		Relationship Estimate	t-value	Relationship Estimate	t-value
H1: Attitude	→ Concerns	-.40	-7.02**	-.40	-7.17**
H2: Concerns	→ Purchases	-.55	-10.89**	-.46	-8.99**
H3: Concerns	→ Off-line	.13	2.15*	.13	2.10*
H4: Off-line	→ Purchases	.12	2.07*	.11	2.07*
H5: Concerns	→ Willingness	-.34	-6.37**	NA	NA
H6: Willingness	→ Purchases	-.05	-1.16	NA	NA
* Attitude	→ Purchases	NA	NA	.17	3.24*

Goodness-of-Fit statistics		
Chi-Square (df)	176.01 (59)	135.10 (39)
Discrepancy /df	2.98	3.46
CFI	.95	.94
RMSEA	.06	.07
GFI	.96	.96
AGFI	.93	.93

Note.

Attitude = Attitude toward Internet shopping. Concerns = Concerns about on-line payment security. Off-line = Attitude toward alternative off-line payment methods. Willingness = Willingness to risk payment security. Purchases = Internet purchases. CFI = Comparative Fit Index. RMSEA = Root Mean Square Error of Approximation. GFI = Goodness-of-Fit index. AGFI = Adjusted Goodness-of-Fit Index

**p* < .05

***p* < .01

NA = not applicable

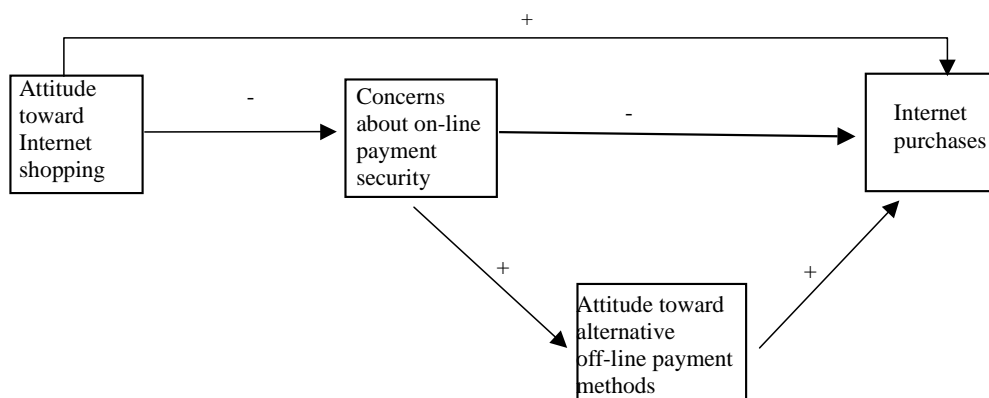


Figure 2. Final model: Consumer concerns about payment security of Internet purchases.

Hypothesis Tests

The relationship between the attitude and Internet purchases appeared to be mediated by “concerns about on-line payment security.” Hypothesis 1 positing the negative relationship between “attitude toward Internet shopping” and “concerns about on-line payment security” was supported. Those who have a positive attitude toward on-line shopping appear less concerned about payment security. As expected, the negative relationship between “concerns about on-line payment security” and “Internet purchases” was found. The more concerned participants were about the security of credit card use, the less likely they were to purchase on-line. Therefore, Hypothesis 2 was supported.

Hypotheses 3 and 4 tested whether providing alternative off-line payment methods can ease the security concerns so as to increase on-line purchases. Both hypotheses were supported. That is, those participants who were concerned about on-line payment security had a positive attitude toward Internet retailers’ provision of alternative off-line payment options and the positive attitude appeared to increase the probability of Internet purchases. The support of Hypotheses 2, 3, and 4 suggests that a negative relation existed between Internet security concerns and Internet purchases, but providing off-line payment methods such as phone and fax can be effective in lessening consumers’ security concerns.

Hypothesis 5 positing the positive relation between “concerns about on-line payment security” and “willingness to risk payment security” was not supported. Hypothesis 6 positing the positive relation between “the willingness to risk payment security” and “Internet purchases” was not supported. Concerns about payment security did not appear to be overcome by the shopping benefits provided including low price and high quality of products or services, and providing or emphasizing such benefits may not be effective in encouraging consumers to make on-line purchases.

Discussion and Conclusions

Although payment security in Internet shopping has been addressed in a number of different ways, including the introduction of e-cash, encryption and decryption technologies, and new forms of personal identification (Kuykendall, 2003; Peterson, Balasubramanian, & Bronnenberg, 1997), it is still a significant issue for today’s Internet shoppers (Light, 2001; McLean, 2003; Stahl, 2002). Concerns about payment security when shopping on the Internet can include both monetary loss (e.g., stolen credit card numbers) and privacy issues (e.g., protection of personal information and identity theft).

Examining the effect of consumer concerns about on-line payment security, we found significant empirical evidence that payment security concerns directly influence actual Internet purchases. Those who were concerned about the safety of on-line credit card use purchased less on-line. The issue of payment security in on-line shopping appeared to be not just a general concern that consumers have toward the Internet shopping medium, but an important factor that

directly determined their decision whether to shop on-line or not. On-line apparel retailers should be aware of this result, since apparel has emerged as one of the major product categories purchased over the Internet. Retailers should continuously make industry-wide efforts to reduce security concerns. Given its critical importance to the future growth of Internet shopping, concerted efforts should be made between public and private sectors. Proper policing of illegal or fraudulent on-line activities will certainly reduce consumers’ security concerns. The challenge stems from the very nature of the Internet, which calls for not only national, but also for international collaboration.

The good news is that payment security concerns can be addressed by providing alternative off-line payment options. On-line retailers’ provision of alternative off-line payment methods appears to have a positive role in reducing the security concerns. That is, although a negative relationship exists between the security concerns and on-line purchases, the security concerns can be reduced by offering off-line payment options that can lead to actual purchases. Thus, retailers’ efforts to provide off-line methods to ease the security concerns appear to be effective. However, unless explicit alternative payment options are provided, the security concerns cannot be overcome simply by providing and promoting better quality and more reasonably priced products. Thus, the message to on-line retailers is loud and clear: they need to explicitly address the security concerns of consumers for a further growth of e-tailing.

We found the attitude toward Internet shopping was an antecedent of concerns about on-line payment security, which consequently influenced on-line purchases. This finding provides additional empirical support to the theory of reasoned action. As the theory posits, consumers evaluate each attribute of Internet shopping, form an overall attitude based on the relative importance of different attributes, and such an attitude determines their on-line purchase decisions. We demonstrated the applicability of the theory to Internet shopping, yielding supporting empirical evidence to the study by Shim and her colleagues (2001).

Practically, our study stresses the importance of improving the general attitude toward on-line shopping in addition to developing and implementing specific security devices to reduce consumers’ concerns. In reality, consumers’ fear of using credit cards via the Internet tends to be misguided. VISA reported that only eight cents of every \$100 spent on the Internet were lost to fraud, and that amount is just one cent more than is lost in traditional transactions (Rowley & Okelberry, 2000). A study by the Center for Trust Online found only 4% of respondents had been victimized by credit card fraud over the Internet, while 17% claimed to know someone who had been victimized (Newmann, 1999). Retailers may question whether payment security concerns are based on objective data and information or just a fear developed from a few anecdotal stories learnt from the media. In fact, the Reality Check Report, U.K. consumer survey, reported that the fear of credit cards being misused, or of Internet fraud, was felt more strongly by non-Internet users than those who had experienced Internet shopping (Ray, 2001). Considering the fact that these concerns are based more on fear than fact-based knowledge and that on-line transactions are as safe as making purchases through tradi-

tional shopping channels, it is critical for Internet retailers to dispel consumers' negative attitudes about the safety of using credit cards on-line through fundamental ways to enhance the general attitude toward Internet shopping.

Future Study and Limitations

We utilized secondary data collected by the GVU's 10th WWW User Survey. The sample mainly consisted of those who have shopped on-line (90.7%). Therefore, the findings of our study cannot be generalized to the general population of Internet users, since the self-selected sample of Internet shoppers is not representative of all Internet users. The use of secondary data also limits the availability of information, which consequently restricts the development of ideal measures. For example, the use of the secondary data resulted in Internet shopping attitude as a single dimensional construct in the model. Future researchers could explore other potential attitude dimensions in examining security issues in Internet shopping. Although the reliability of the attitude construct is acceptable for exploratory purposes, the scales should be refined to increase their reliabilities.

We examined the effect of the provision of alternative off-line payment methods such as telephone and fax. Future researchers should examine the different types of security measures and policies that on-line retailers use. Other security features such as encryption technologies, operating off-line accounts for on-line transactions, and implementing security reliever policies could have significant influences on consumers' security perception and purchase decisions. Finally, consumers' security concerns may have changed along with the increased popularity of on-line transactions. Therefore, the replication of this study using recent data is suggested to examine if any changes in consumers' security concerns have occurred, as we used the data collected at the end of 1998.

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