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Who's Afraid of the World Wide Web? An Initial Investigation into the Relative Impact of Two Salient Beliefs on Web Shopping Intent

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Abstract

The growth of World Wide Web consumer activity that requires that an individual place sensitive personal information online continues to increase at a phenomenal rate. This study investigates two beliefs about shopping on the web (perceived usefulness and perceived web security) to determine their impact on intent to gather information about products and to purchase products using the World Wide Web. Data from 119 university students is used to develop a scale to assess web security concerns and to perform an initial analysis. Implications are discussed.

Introduction

Internet commerce, even that which requires the provision of sensitive personal information, continues to grow at a rapid pace. International Data Corporation reports that Internet commerce revenues will reach \$30,000,000,000 by 2001 (IDC, 1997) and that the number of web-based shoppers in the US will surpass 1,000,000 by 2000 (Blair, 1997). However, there are a variety of threats to personal security when placing personal information on the World Wide Web. The popular press abounds with stories of credit card information theft, personal information breaches, and even ActiveX applications that attach themselves to online banking programs to provide hackers with access to an individual's bank accounts (CSCI, 1998). While security is a concern, the growth of Internet commerce suggests that shoppers perceive a utility to web-based shopping. Web-based shopping largely involves a trade-off between perceived web security and perceived usefulness. This study assesses these constructs and their relative influence on intent to gather information and intent to purchase products on the World Wide Web. A scale is developed to measure perceived web security, and a theoretically derived model is analyzed using structural equations modeling. Implications are discussed.

Theoretical Development

Attitude toward adopting an innovation such as web shopping draws upon a variety of sources for its operationalization (Fishbein and Ajzen, 1975, 1981; cf. Davis, 1989; Moore and Benbasat, 1991). The theory of reasoned action (Fishbein and Ajzen, 1975; 1981) suggests that attitudes can be used to predict behavioral intentions and behaviors. Behaviors are driven by behavioral intention, which itself is the product of attitude toward the behavior and subjective norm with respect to the behavior. Attitude, which is most relevant to the present discussion, is based on the salient beliefs that a person has about the consequences of a given behavior and his or her evaluation of those consequences. Moore (1989; Moore and Benbasat, 1991) suggests that attitude in the context of IT usage deals with innovations. Consequently, he posits that attitude can be synthesized from perceived characteristics of innovating (cf. Rogers, 1983). In the present case, salient beliefs about adopting a particular IT innovation such as web-based shopping were operationalized as *perceived usefulness*, the degree to which a system is perceived to enhance one's performance (Davis, 1989), and *perceived web security*, which is defined here as the extent to which one believes that the web is secure for transmitting sensitive information (such as credit card or social security numbers). In this study, these two beliefs are used to predict behavioral intentions of web users.

Causal Model

The causal diagram for the present research is located in Figure 1.¹ It is believed that two component activities constitute web shopping: 1) gathering information about a product and 2) purchasing the product. The salient beliefs about web shopping address the utility of shopping on the web (perceived usefulness) and security concerns about web shopping (perceived web security). We suggest the following relationships:

1. Perceived usefulness will positively influence intent to gather information on the web.

¹To save space, the final path loadings are also included in this model.

2. Perceived usefulness will positively influence intent to purchase on the web.
3. Perceived web security will positively influence intent to gather information on the web.
4. Perceived web security will positively influence intent to purchase on the web.
5. Intent to gather information on the web will positively influence intent to purchase on the web.

While some of the suggested relationships are intuitive, two in particular require elaboration. First, we suggest that security concerns will influence a user's intent to gather information because of factors such as the increased attention provided by the media to web "cookies" that gather information about pages that a user has visited and provide information to those wishing to advertise certain products. This means that users of the web could find themselves exposed to personal security breaches by simply browsing, hence our proposed relationship. Second, we believe that intent to gather should influence intent to purchase, because if individuals overcome their security concerns about the web and engage in information gathering activity, it is a less difficult step for those persons to then purchase using the web.

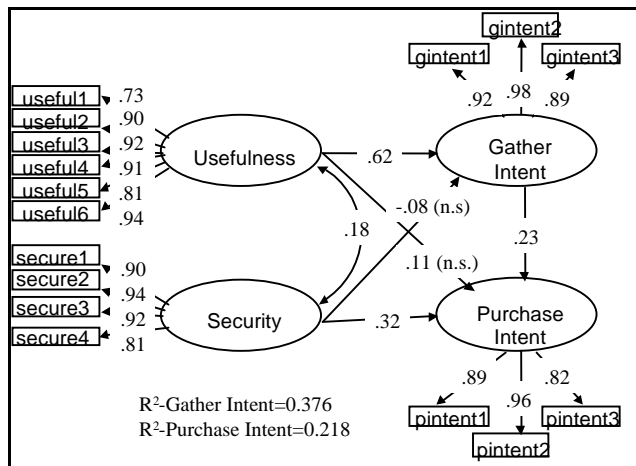


Figure 1. Causal Paths

resulted in the scale items shown in Table 2.³ Items in each of the scales demonstrated acceptable loadings (0.60 or greater—Bagozzi and Yi, 1988) and high reliability (Cronbach > .90). Table 2 details the item loadings and alphas, as well as the items themselves.

Table 1. Descriptive Statistics

Variable	Min	Max	Mean	s.d.
Age	18.0	41.0	20.5	3.02
GPA	1.0	4.0	3.02	.608
Previous Gathering	1.0	7.0	4.25	1.79
Previous Purchasing	1.0	7.0	1.59	1.18
Gender	M=60	F=57	NR=2	

significant ($\beta = 0.62$). However, the influence of usefulness on intent to purchase was not significantly different from zero at $p = 0.05$. The suggested impact of perceived web security on intent to purchase was also significant ($\beta = 0.32$). However, the relationship between perceived web security and intent to gather (β of -0.08) was not significant at $p = 0.05$. The expected effect of intent to gather on intent to purchase was supported by the data ($\beta = 0.23$). Finally, the squared multiple correlation (R^2) indicates that the present model explains 37.6% of the variance in intent to gather and 21.8% of the variance in intent to purchase.

Method

119 undergraduate students taking an introduction to computing course at a Southeastern US University² completed a survey instrument designed to measure their salient beliefs (perceived usefulness and perceived web security) and their intents to gather information and to purchase products on the web. Demographics are presented in Table 1. Items for measuring perceived usefulness were adapted from Davis (1989) by modifying the attitude object. Since no security scale was identified, items were devised for that scale and tested, as were items for intent to gather and intent to purchase.

The first step in the analysis was to test the new scales (perceived web security, intent to gather, intent to purchase) using structural equations modeling for confirmatory factor analysis (cf. Long, 1983). Reliability of the three scales was first examined by specifying a single factor model in a confirmatory factor analysis using AMOS 3.6 (Arbuckle, 1996). The analysis

Model Findings

The causal diagram for the model is found in Figure 1. Our analysis supports several findings. First, all of the scales employed here demonstrate favorable psychometric properties when combined in the full model (e.g., the items appear to converge on their respective constructs, and not on other constructs). Secondly, the model appears to demonstrate reasonable fit, as seen in the fit indices in Table 3.

From a substantive viewpoint, our model is partially supported. The anticipated influence of perceived usefulness on intent to gather was

²Originally the items were presented to 168 students, but missing responses dictated that we eliminate 49 of the questionnaires.

³Space limitations preclude depicting this analysis here.

Table 2. Scale Items After CFA (Item Loadings)

<i>Web Security</i> $\alpha = 0.93$	
1.	I would feel secure sending sensitive information across the world wide web. (0.82)
2.	The world wide web is a secure means through which to send sensitive information. (0.93)
3.	I would feel totally safe providing sensitive information about myself over the world wide web. (0.93)
4.	Overall, the world wide web is a safe place to transmit sensitive information. (0.77)
<i>Gathering Intent</i> $\alpha = 0.95$	
1.	I would use the world wide web for gathering information about products I might purchase. (0.92)
2.	Using the world wide web for gathering information about a product I might purchase is something I would do. (0.98)
3.	I could see myself using the world wide web for gathering information about a product I might purchase. (0.89)
<i>Purchase Intent</i> $\alpha = 0.92$	
1.	I would use the world wide web for purchasing a product. (0.88)
2.	Using the world wide web for purchasing a product is something I would do. (0.97)
3.	I could see myself using the world wide web to buy a product. (0.82)
<i>Perceived Usefulness</i> $\alpha = 0.95$	
1.	Using the World Wide Web would enable me to accomplish my tasks more quickly. (0.73)
2.	Using the World Wide Web would improve my performance. (.90)
3.	Using the World Wide Web would increase my productivity. (.94)
4.	Using the World Wide Web would enhance my effectiveness. (.92)
5.	Using the World Wide Web would make it easier for me to carry out my tasks. (.91)
6.	I would find the World Wide Web useful. (.81)

Responses were given on a seven-point Likert scale, 1= *Strongly Disagree* , 7= *Strongly Agree*

Responses were given on a seven-point Likert scale, 1= *Extremely Unlikely*, 7= *Extremely Likely*.

its non-influence on purchase intent, it is clear that security is the driving influence in purchasing products on the web, and the trade-off between this and the utility of web shopping is not perceived to be a good one. Still, it may be that the non-significant relationship between usefulness and purchase intent could be because the relationship between usefulness and intent to purchase on the web is mediated by gathering intent. This may bear further investigation.

This study provides many opportunities for future research. One issue that should be addressed is the constructs that were chosen. Future research could address other relevant constructs. For example, purchasing on the web might not be the only outcome of gathering information on the web. It is likely that web advertising will favorably influence purchasing a company's products through other avenues, not just over the web. In addition, we have not addressed the issue of one's access to the Internet. Web-based shopping is not especially relevant if one cannot readily access the Internet. Finally, the measures created

Discussion and Conclusion

The present study makes several contributions to the literature. First, a psychometrically sound measure for perceived web security has been developed. Second, we have identified two relevant constructs that may influence intent to gather information and intent to purchase products on the World Wide Web. Our initial effort indicates that both usefulness and security are salient beliefs about web-based shopping. We found that increased levels of perceived web security will lead to greater intent to purchase products on the web, and that greater levels of perceived usefulness increase the likelihood that an individual will gather information about products on the web. In addition, once one has adopted the innovation of gathering product information on the web, it is more likely that the person will also purchase products on the web. These findings support our theory and previous research into innovation adoption.

The proposed link between perceived web security and intent to gather was not supported in this study. This suggests that subjects in our sample may not perceive a security threat from browsing the World Wide Web to gather information about products. This may have been due to the majority of the sample being novice computer users, and hence unaware of the threat of such things as "cookies" "packet sniffers".⁴ However, the significant relationship between perceived web security and intent to purchase shows that the subjects are indeed aware of the potential risks associated with supplying the sensitive information that is required to actually purchase a product over the web.

The suggested link between perceived usefulness and intent to purchase was not significant. We believe that this relationship is best conceptualized as a mediated relationship. Based on the results of this study, one's perceived usefulness regarding the web leads him or her to gather product information, which in turn leads the user to actually purchase a product. It may be highly unusual for a user to purchase on the web without using the web to gather information first.

Our study is not without limitations. First, our student sample may not be representative of the population of web shoppers. Secondly, the responses to the items may have been constrained due to the subjects' lack of previous experience with web shopping. In the case of usefulness and

⁴Thanks to one of our anonymous reviewers for mentioning this. We did include a measure of perceived web experience, but the sample was largely drawn from an introduction to computing course, so one would expect little variance in the knowledge of web security threats. We have plans to sample a more web-savvy group in the near future.

Table 3. Model Fit Indices

Statistic	Suggested	Obtained
χ^2		240.678
χ^2 , baseline model		2067.768
d.f.		98
d.f, baseline model		120
χ^2 significance	$p \geq 0.05$	0.00
$\chi^2/d.f.$ (Wheaton et al., 1977)	< 5.0	2.456
RMR, (C) (Hu & Bentler, 1995)	<0.10	0.054
GFI (Joreskog & Sorbom, 1988)	> 0.90	0.804
AGFI (Joreskog & Sorbom, 1988)	> 0.80	0.728
δ -1 (Bentler & Bonnett, 1980)	> 0.90	0.884
ρ -1 (Bollen, 1986)	> 0.90	0.857
δ -2 (Bollen, 1989)	> 0.90	0.928
ρ -2 (Tucker & Lewis, 1973)	> 0.90	0.910
CFI (Bentler, 1990)	>0.90	0.927
RNI (McDonald & Marsh, 1990)	>0.90	0.927

Numbers in bold surpass their recommended value.

for this study should undergo further refinement. It is clear that more and different variables are needed to fully understand web-based shopping. It is a relatively new phenomenon, and as such may require additional rethinking of models used to explain its adoption.

References

References are available on request from the first author.