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Communications of the Association for Information Systems

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Abstract:

Among the many characteristics that impact the use of e-commerce, one that has received relatively little attention is gender. Extant evidence suggests that men and women differ in their beliefs regarding the use of information technology-related innovations, including e-commerce. However, less is known about how gender moderates the impact of various beliefs on behavioral intentions. In this study, we use a model derived from diffusion of innovations theory to examine gender differences in the degree to which various beliefs regarding e-commerce impact intentions to make purchases online. Results indicate that gender does moderate the influence of beliefs on use intentions in the context of consumer e-commerce. Specifically, our study finds that relative advantage is relatively more important for men and that compatibility is relatively more important for women. We explain why this may be true, discuss the implications of these findings and suggest several areas for future research.

Keywords: IT diffusion and adoption, user acceptance of IT, e-commerce

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I. INTRODUCTION

Consumer-oriented electronic commerce continues to grow, despite the "dot-com bomb." Every year, more consumers turn to online sources for acquiring goods and services, with estimates suggesting that US online sales will reach \$239 billion by 2013 [Evans 2009]. As online shopping matures, merchants are competing with each other for customers and will need to find ways to differentiate themselves from their competitors and to convert browsers to buyers. One possible differentiating factor affecting the decision to engage in e-commerce could be gender [Van Slyke et al. 2002a]. But the results of research focusing on gender have been mixed. Although research has historically found that men are more likely to make online purchases [Akhter 2003; Cho and Jialin 2008; Whitley 1997], recent research has found that women were nearly twice as likely to make online purchases using a popular online auction site [Black 2007]. In addition, research has also argued that women and men value different capabilities in e-commerce, with women focusing more on trustworthiness and assurance issues and the ability to share opinions and ideas and men focusing more on the value gained through the purchase [Awad and Ragowsky 2008; Cho and Jialin 2008; Rodgers and Harris 2003]. In addition, research has also found that most e-commerce sites are designed to be more compatible with male preferences, and, when this is done, the websites are less attractive to women [Moss et al. 2006].

Although each of these studies have added to our understanding of the role of gender in e-commerce, they lack an overall theoretical underpinning, focusing either on gender differences in a single factor such as trust assurance or by using gender as a direct antecedent to adoption decisions. In addition, this research suggests that men and women may also differ in the relative importance of the different factors which affect their decision to engage in e-commerce. Thus, our models of e-commerce adoption may need to be expanded to investigate gender as a moderator of the relationship between e-commerce characteristics and purchase intentions. Using innovation diffusion theory, this paper builds on previous work on information technology (IT) and e-commerce adoption [Gefen and Straub 1997; Van Slyke et al. 2002a; Venkatesh and Morris 2000; Venkatesh et al. 2000] to examine the moderating effect of gender on consumer e-commerce adoption. By developing richer models of the role of gender in e-commerce adoption, we can better inform merchants on how to capitalize on gender differences so they can design more effective e-commerce websites which encourage both men and women to purchase online. In addition, we can inform them on approaches which can provide them a competitive advantage over others in the market. To do this, though, we need stronger, more complete theoretical models of the moderating role of gender. Therefore, we focus on the following research question:

Do beliefs regarding the characteristics of e-commerce and the trustworthiness of web merchants impact use intentions differently according to gender?

To investigate this research question, we use prior literature on gender-based differences in IT adoption and consumer behavior to derive hypotheses based on the framework. We test those hypotheses empirically using data from a survey.

This paper is organized as follows. First, using the prior literature on gender-based differences in IT adoption and consumer behavior, we present a theoretically derived research model and discuss the literature on which it is based. Then, we present the hypotheses based on this model. This is followed by a description of the empirical study and the results of hypothesis tests. The paper concludes with a discussion of these results and their implications, limitations of the study, and future research opportunities.

II. RESEARCH FRAMEWORK

The framework guiding our research is derived from a synthesis of diffusion of innovations theory and research concerning trust and trustworthiness in the context of consumer-oriented e-commerce. Diffusion of innovations theory is concerned with how new ideas, technologies or practices spread throughout a social system [Rogers 2003]. In this research, we focus on one particular area of diffusion theory: beliefs that are thought to influence adoption decisions. Adoption, which is defined as the decision to make use of an innovation, is influenced by a variety of beliefs, including beliefs about the characteristics of the focal innovation. These beliefs, termed perceived innovation characteristics, have been widely studied in the IT adoption and acceptance literatures [cf. Moore and Benbasat 1991; Agarwal and Prasad 1997]. These are perceived relative advantage, compatibility, complexity, perceived observability and perceived image [Rogers 1983].

Perceived relative advantage (RA) is the potential adopter's beliefs as to whether the innovation is superior to its predecessor [Rogers 2003]. There are a number of dimensions to relative advantage, including savings in time and effort, economic profitability, low initial cost, and a decrease in discomfort [Rogers 2003]. Research into IT adoption has overwhelmingly investigated the first of these, savings in time and effort [Van Slyke et al. 2008]. This idea may be equated to perceived usefulness, a key component in the Technology Acceptance Model (TAM). Perceived RA and the similar concept of perceived usefulness have been included in many studies of IT adoption, and have received support in a variety of contexts, including e-commerce [Chen et al. 2004; Gefen et al. 2003; Inhetveen 1999; Van Slyke et al. 2004; Van Slyke et al. 2005], instant messaging [Ilie et al. 2005], and smart cards [Plouffe et al. 2001].

Perceived compatibility (CT) is the potential adopter's beliefs of the degree to which the focal innovation fits with the adopters' existing needs, values and experiences [Rogers 2003]. Perceived compatibility, which has a positive relationship with use intentions, has received considerable support in the empirical literature. For example, in a study of smart card adoption by merchants, Plouffe et al. [2001] found that compatibility had a significant influence on use intentions. Other studies have found similar results in the context of groupware [Van Slyke et al. 2002b], healthcare information systems [Herbert and Benbasat 1994], and e-commerce [Plouffe et al. 2001; Van Slyke et al. 2004; Van Slyke et al. 2002b].

Perceived complexity is the degree to which the potential adopter views the innovation as being relatively difficult to use and understand [Rogers 2003], and is thought to have a negative impact on use intentions. Much of the literature on IT adoption and acceptance uses perceived ease of use (EOU), rather than complexity. Ease of use is considered the conceptual opposite of complexity. In this study, we follow the norm in the IT literature and use ease of use rather than complexity. The impact of ease of use and complexity on use intentions has been empirically demonstrated [Agarwal and Karahanna 2000; Gefen et al. 2003; Van Slyke et al. 2002b].

Rogers [2003] also points to perceived observability as having an influence on adoption decisions. Moore and Benbasat [1991] decomposed observability into two components: perceived result demonstrability and perceived visibility. Perceived result demonstrability (RD) pertains to the apparentness of the outcomes of the use of the innovation. In contrast, perceived visibility (VI) concerns the degree to which the use of the innovation is apparent. Both perceived result demonstrability and visibility have positive impacts on use intentions. Although there is less empirical support for these relationships, there is some evidence of the impact of both result demonstrability [Agarwal and Prasad 1997; Van Slyke et al. 2002b], and visibility [Agarwal and Prasad 1997; Van Slyke et al. 2002b].

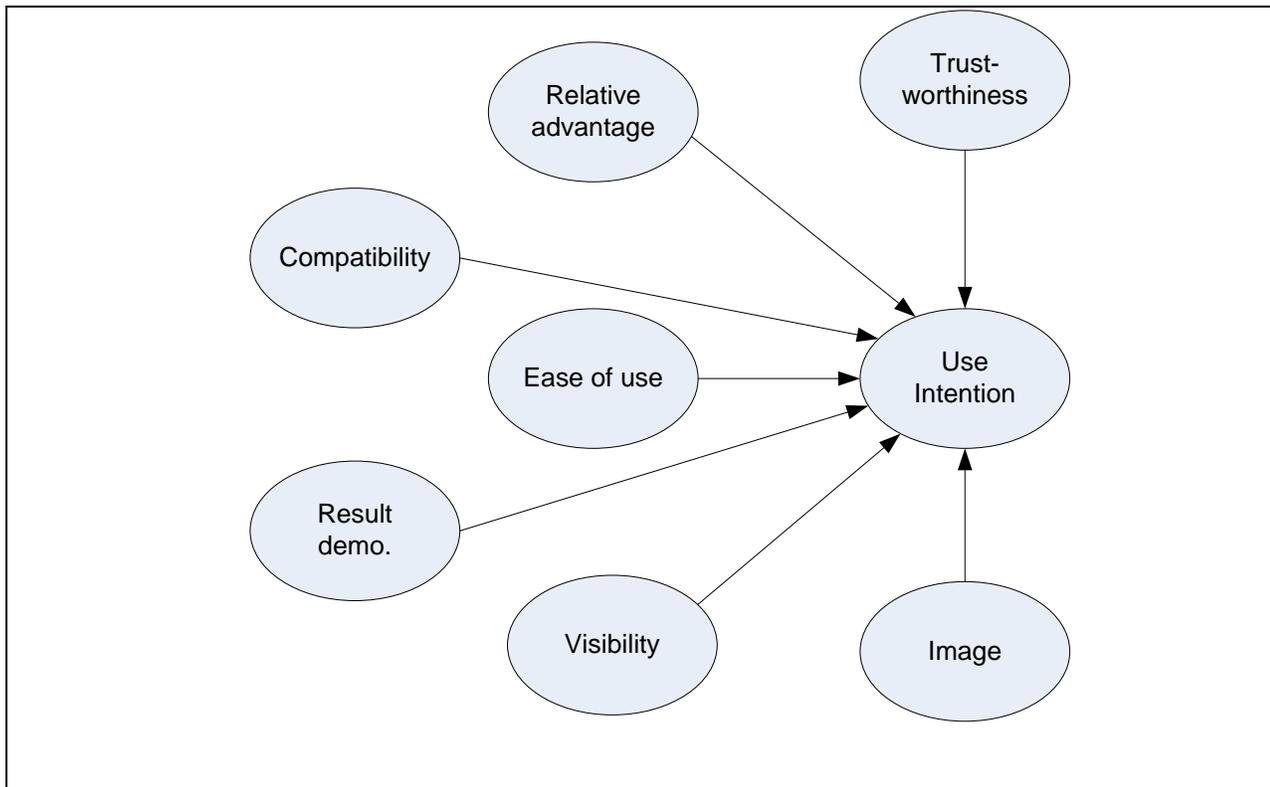


Figure 1: Research Framework

Another belief that may influence the adoption decision is the degree to which adoption enhances the social status of the adopter, or what Rogers [2003] calls *perceived image* (IM). Image has received relatively little attention in the information systems adoption literature, although there have been some IS innovation studies that have included image [Agarwal and Prasad 1997; Van Slyke et al. 2002b].

An additional belief that may be particularly applicable to the study of e-commerce is trustworthiness. There is a growing body of evidence concerning the impact of trustworthiness (TW) beliefs on the use of e-commerce [Bélanger et al. 2002; Gefen et al. 2003; Jarvenpaa and Tractinsky 1999; Jarvenpaa et al. 2000; McKnight et al. 2002b; Pavlou and Gefen 2004; Van Slyke et al. 2004]. In the context of e-commerce, trustworthiness may be defined as “beliefs about whether web merchants possess qualities that make them deserving of trust” [Bélanger et al. 2002, p. 253]. The literature has shown considerable support for the positive influence of trustworthiness on intentions to use e-commerce [Gefen 2000; Gefen et al. 2003; Jarvenpaa et al. 2000; McKnight et al. 2002a; Pavlou and Gefen 2004; Van Slyke et al. 2004].

The literature described in this section posits and provides empirical evidence of the positive impact of the factors discussed on use intentions. Figure 1 graphically shows these relationships. All paths in the diagram are expected to have positive coefficients.

Our goal is to compare the strengths of these impacts across genders. To that end, the next section discusses gender-based differences with respect to information technology and consumer behavior.

III. GENDER, INFORMATION TECHNOLOGY AND SHOPPING

In this section, we synthesize literature on IT-related gender-based differences and the literature on gender-based differences in consumer behavior. This synthesis is used to develop hypotheses related to our research question.

As information technology continues to become a more integral part of life, it becomes increasingly important to understand differences across groups of users [Morris et al. 2005]. Thus, it is worthwhile to investigate gender-based differences with respect to information technology adoption and use. Unfortunately, although there are exceptions [Gefen and Straub 1997; Ilie et al. 2005; Morris et al. 2005; Venkatesh and Morris 2000], relatively little research has been done in this area, and researchers have called for more attention to be focused on this important topic [Adam et al. 2003].

There is evidence that women and men view information technology differently. For example, it has been shown that women and men differ in their views of web-based shopping [Van Slyke et al. 2002a]. In general, women view IT less favorably than men [Li et al. 2001; Schumacher and Morahan-Martin 2001]. A number of possible explanations for this have been put forward, including less experience with IT, higher levels of computer anxiety, and lower self efficacy [Durndell and Haag 2002; Igbaria and Chakrabarti 1990].

There is also evidence that men and women differ in their behaviors as consumers [Mitchell and Walsh 2004; Palan 2001]. Gender-based differences have been identified in a variety of consumer-behavior factors, including purchasing behavior [Pahl 1990], attitudes toward shopping [Jansen-Verbeke 1987], information search [Cleveland et al. 2003], and shopping stereotypes held [Dholakia and Chiang 2003]. Our interest here is not on differences in beliefs and attitudes related to IT or shopping. Rather, we are interested in better understanding how differences in beliefs impact behavioral intentions.

Perceived Relative Advantage

In the context of IT-related use intentions, there is evidence that men are more influenced by their perceptions of perceived usefulness than are women [Venkatesh and Morris 2000]. Given that perceived usefulness is related to perceived relative advantage, it is reasonable to expect that relative advantage will be a stronger determinant for men than women. There are several reasons that men may be more driven by beliefs about the utility of an innovation. In general, men tend to be more focused on instrumental aspects of behaviors and are more motivated by goal achievement [Boneva et al. 2001; O'Neil 1982]. Men are also more influenced by the instrumentality of an information technology, especially in the short-run [Morris et al. 2005]. The usefulness of an information technology innovation is largely a function of its ability to help improve efficiency and effectiveness. Therefore, men, being more instrumental and achievement oriented, are likely to be more influenced by relative advantage.

The consumer-behavior literature lends support to this thinking. There is evidence that males' consumer decision making may be characterized as being more oriented toward time-saving [Mitchell and Walsh 2004]. As a result, the time-saving efficiency of e-commerce may be more of a motivator for men than for women. In addition, men are more variety seeking in their purchasing behaviors [Mitchell and Walsh 2004] and online shopping allows for greater

product choice for the consumer. E-commerce can effectively increase product choice by making product search and comparison tasks more efficient. As a result, men's e-commerce behaviors may be more strongly influenced by the relative advantages of shopping online.

From this body of literature, we posit that relative advantage will have a stronger influence on use intentions for men than for women. Thus, we state the following hypothesis.

H1: In the context of consumer-oriented e-commerce, perceived relative advantage will have a greater impact on use intentions for men than it will for women.

Perceived Compatibility

The impact of gender on the relationship between compatibility and use intentions has received little attention in the literature. Gender differences in the compatibility of e-commerce have been found [Van Slyke et al. 2002a], but there is a lack of empirical evidence regarding gender-based differences in the impact of perceived compatibility on use intentions. To understand gender differences, it may be useful to consider *lack* of compatibility as being a barrier to use. In other words, compatibility is not a reason to adopt an innovation, but a lack of compatibility may be a reason to *not* adopt. Because women perceive e-commerce to be less compatible [Van Slyke et al. 2002a], we believe that compatibility may have a greater influence on use intentions for women.

There is evidence that use intentions of individuals who find e-commerce less compatible are more heavily influenced by perceived compatibility. A study comparing Indian and American consumers' e-commerce beliefs reports that Indian consumers find e-commerce to be significantly less compatible than American consumers do. In an exploratory post-hoc analysis, this same study found that Indian consumers' use intentions are more heavily influenced by perceived compatibility than were American consumers [Van Slyke et al. 2005]. Because female consumers find e-commerce to be less compatible than men do, it may be that women's use intentions will be more strongly influenced by compatibility.

The consumer behavior literature also provides guidance with respect to the relative impact of compatibility. When making purchasing decisions, women are more attentive to subtle information cues than men are. Men tend to focus on available information cues selectively, while women tend to consider a variety of cues [Cleveland et al. 2003]. Online shopping does not allow for as great a variety of information cues as face-to-face shopping, such as the facial expressions of salespeople, the feel of a fabric and subtle color characteristics. Therefore, e-commerce may be at odds with female consumers' desire for subtle information cues. This lack of compatibility may further argue for perceived compatibility being a stronger influence on use intentions for women. Therefore, we state the following hypothesis.

H2: In the context of e-commerce, perceived compatibility will have a greater impact on use intentions for women than it will for men.

Perceived Ease of Use

In general, research shows that women have higher levels of computer anxiety [Durnell and Haag 2002; Huang et al. 2004; Igbaria and Chakrabarti 1990] and lower levels of self-efficacy than men [Hartzel 2003; Venkatesh and Morris 2000]. In addition, most studies of gender and computer use find that women are less enthusiastic about computers, less confident regarding their computer use and spend less time on computers [Li et al. 2001]. Also, women generally have greater exposure to and experience with computers [Wasserman and Richmond-Abbott 2005]. Less experienced and less confident users are likely to be more heavily influenced by the ease of use of an innovation.

Evidence exists to indicate that women's use intentions are more strongly influenced by ease of use [Venkatesh and Morris 2000]. As noted earlier, women use a greater variety of information when making purchasing decisions. While men tend to use simplifying heuristics, women, in general, try to perform a comprehensive and detailed analysis of all information, up to the limits of their information processing capacity [Cleveland et al. 2003]. Even though some subtle information cues may not be available in e-commerce, the online environment makes a large amount of information available. Because women typically try to pay attention to more information sources than men, women may be more prone to information overload than men. Men may be better equipped to deal with the increased amount of information available online because they may use their simplifying heuristics to limit the amount of information to be processed. In contrast, women may attempt to make use of all available information. This may be particularly frustrating for female shoppers because of the absence of subtle information cues. Women may experience the situation where there is too much of one kind of information, but not enough of another. In addition,

evidence exists to indicate that women's use intentions are more strongly influenced by ease of use [Venkatesh and Morris 2000].

For the reasons outlined above, we believe that the perceived ease of use of consumer-oriented e-commerce will have a greater impact for women, as reflected in the following hypothesis.

H3: In the context of consumer-oriented e-commerce, perceived ease of use will have a greater impact on use intentions for women than it will for men.

Perceived Result Demonstrability

As stated earlier, some research indicates that men are more motivated by the utility of an innovation and are more focused on the instrumentality of new technologies [Morris et al. 2005]. Men are also more task and efficiency-oriented than women [Minton and Schneider 1980], especially when it comes to shopping activities [Mitchell and Walsh 2004]. In the context of IT innovations, perceived usefulness has a greater influence on use intentions for men than for women [Venkatesh and Morris 2000]. Following this thinking, it may be that men's use of e-commerce is more heavily influenced by perceptions of result demonstrability. Recall that result demonstrability pertains to the outcomes of using an innovation. Being task and efficiency oriented, innovations with readily apparent outcomes (high result demonstrability) are likely to be attractive to men. This leads to our next hypothesis.

H4: In the context of consumer-oriented e-commerce, perceived result demonstrability will have a greater impact on use intentions for men than it will for women.

Perceived Visibility

Women tend to be more social [Wood and Rhodes 1992] and network-oriented [Tannen 1990] in their communication. In addition, women have higher needs for affiliation and therefore may be more heavily influenced by social factors [Morris et al. 2005] than men. For example, women's buying behavior is more sensitive to the opinions of friends [Shoaf et al. 1995], and women are more likely to exchange information with other consumers [Mitchell and Walsh 2004].

For women, the subjective norm of using an innovation has a significant influence on use intentions. The same cannot be said for men [Morris et al. 2005; Venkatesh and Morris 2000]. Together, these findings may indicate that women are more aware of the use of e-commerce by those in their social networks. Further, it may be that the degree to which others are using e-commerce has more of an impact for women. High visibility not only increases awareness of e-commerce, but may also act as a signal of subjective norm. Therefore, we propose the following.

H5: In the context of consumer-oriented e-commerce, perceived visibility will have a greater impact on use intentions for women than it will for men.

Perceived Image

There is considerable evidence that women will be influenced more by image than men. Women tend to be more social and network-oriented than men [Wood and Rhodes 1992]. Women also have higher needs for affiliation and therefore may tend to be more influenced by social norms [Morris, Venkatesh, and Ackerman 2005]. Since perceived image is concerned with how adoption will influence the social status of the adopter and women are more sensitive to social influences, we raise the following hypothesis:

H6: In the context of consumer-oriented e-commerce, perceived image will have a greater impact on use intentions for women than it will for men.

Trustworthiness

There is some evidence that trustworthiness is more important in the early stages of a relationship [Rempel et al. 1985]. Although the gap may be narrowing, women generally have less experience with the Internet and online shopping [Ono and Zavodny 2003; Rogers and Harris 2003]. Despite the growing use of e-commerce by women, it is still likely that men have more past experience in the online environment, which leads us to believe that the trustworthiness of Web merchants will be more important for women. There is some evidence that women are more influenced by trustworthiness. In a study of factors influencing satisfaction with e-commerce, Rogers and Harris [2003] found low trust to be a predictor of low satisfaction among women.

In addition, trust is more important in risky situations. Overall, men have higher levels of general risk propensity [Powell and Johnson 1995], and are more willing to take risks associated with buying behaviors [Mitchell and Walsh

2004]. Trustworthiness and risk are related. In essence, the more sensitive one is to risk exposure, the higher the level of trustworthiness must be in order for a behavior to occur. Because men are less influenced by risk, we expect trustworthiness to have less influence on men's behavioral intentions with respect to e-commerce, as stated in the following hypothesis.

H7: In the context of consumer-oriented e-commerce, the trustworthiness of web merchants will have a greater impact on use intentions for women than it will for men.

An empirical study was conducted to investigate these hypotheses. In the next section, we describe the methodology used in that study. Results of hypothesis tests are also provided.

IV. METHOD

Overview

Using data from consumers who were currently enrolled in courses at one of three large universities in the United States, the current study examined the relationships among gender, relative advantage, compatibility, ease of use, visibility, result demonstrability, image, trustworthiness beliefs and use intentions. Validity and reliability analysis were conducted using Partial Least Squares (PLSGraph 3.0). Ordinary Least Squares (OLS) Regression was used for hypothesis testing and to compute descriptive statistics.

Participants

A total of 507 individuals participated in the study, of which 295 were male and 212 were female. Table 1 provides some statistics comparing the samples. Participants ranged in age from seventeen to forty-eight years with a median age of twenty years. A large majority of those participating had access to a credit card that could be used for online purchases. Virtually all (99.6 percent) of the participants had access to a computer that could be used for making online purchases. Participants reported using the web frequently, spending an average (mean) of over nine hours per week on the web. Overall, male and females were similar in these characteristics, although the males were slightly older on average and spent slightly more time on the web each week. In addition, there is a relatively large difference in prior web purchasing experience, with approximately 39 percent of the women and 60 percent of the men having made purchases over the web. Because of the relatively large difference in prior web purchasing experience, we included this factor as a covariate in our hypothesis testing.

Characteristic	All	Female	Male
Age (mean)	19.9	19.6	20.1
Hours per week using web (mean)	9.4	9.0	9.7
Access to a credit card	81.9%	80.7%	82.7%
Access to a computer for web purchasing	99.6%	99.5%	99.7%
Prior web purchase	51.1%	38.7%	60%

Measures

Scale items representing the constructs of interest were primarily drawn from previously-validated scales. Scales for relative advantage, compatibility, ease of use, result demonstrability, visibility, and image were derived from Moore and Benbasat [1991] while a new scale was developed for web merchant trustworthiness. Demographic and experiential data were gathered using direct questioning. All scales are found in the Appendix. Descriptive statistics for the scales are shown in Table 2.

Scale	All		Women		Men	
	M	SD	M	SD	M	SD
RA	4.404	1.202	4.027	1.199	4.675	1.131
CT	3.581	1.368	3.192	1.319	3.860	1.336
EOU	4.768	1.084	4.539	1.084	4.933	1.055
RD	4.790	1.005	4.593	0.928	4.932	1.035
VI	4.428	1.030	4.384	1.031	4.459	1.029
IM	3.239	0.940	3.198	0.929	3.269	0.948
TW	3.774	1.061	3.558	1.045	3.929	1.048
UI	4.309	1.679	3.844	1.695	4.643	1.589

V. RESULTS

Measurement Model

Using the full dataset, a measurement model was tested to assess each scale's reliability, internal consistency and convergent and discriminant validity. Results of this analysis are shown in Table 3. In the table, shaded elements along the diagonal represent the square root of the average variance explained (AVE) and the off-diagonal elements represent inter-scale correlations. For discriminant validity, diagonal elements (square root of the AVE) should be larger than off-diagonal elements (inter-scale correlations). As can be seen from the table, this is the case for all scales. Internal consistency was assessed by examining composite reliability statistics reported in PLS-Graph. With the exception of visibility, the composite reliability for all scales exceeds the commonly-used cutoff of 0.70 [Straub et al. 2004]. The composite reliability of the visibility scale (0.631) is slightly below this cutoff.

A common rule of thumb is that for acceptable convergent validity, item loadings should exceed 0.707 and the AVE for the construct should exceed 0.50 (put differently, the square root of the AVE should exceed 0.707) [Straub et al., 2004]. While the majority of items and constructs exceeded these thresholds, visibility was problematic with one item loading poorly (< 0.707). At the same time, the scale did explain more than half of the variance in the construct. The poor reliability of this scale is likely due to the fact that we used short-forms of the scales (as recommended by Moore and Benbasat [1991]). The short form of the visibility scale has only two items, one of which is reverse-worded, which likely had a negative impact on scale reliability. The decision was made to retain this scale because the scale has been successfully used in multiple contexts, together the items explained more than half of the variance in visibility, and well established scales sometimes exhibit poor loadings when used in different research contexts [Barclay et al. 1995]. However, results related to visibility should be viewed with caution.

Table 3: Measurement Model Statistics

	CR	1	2	3	4	5	6	7	8
1. Relative Advantage	0.869	0.830							
2. Compatibility	0.931	0.726	0.904						
3. Ease of Use	0.852	0.496	0.447	0.770					
4. Result Demonstrability	0.753	0.451	0.362	0.611	0.722				
5. Visibility	0.631	0.443	0.482	0.428	0.373	0.707			
6. Image	0.834	0.308	0.366	0.046	0.072	0.127	0.792		
7. Trustworthiness	0.925	0.354	0.463	0.431	0.297	0.386	0.271	0.897	
8. Use Intention	0.970	0.623	0.676	0.570	0.543	0.478	0.190	0.472	0.957

Notes: CR = Composite Reliability

Diagonal: Shaded elements are the square root of the average variance extracted.

Hypothesis Testing

To test the hypotheses, ordinary least squares regression was used to compute separate equations for females and males. For both groups, the components of the structural model explain a large portion of the variance in use intentions ($R^2_{adj.} = 0.712$ for women and 0.708 for men). For women, perceived compatibility, ease of use, result demonstrability, visibility, and the trustworthiness of web merchants impacted intentions to use e-commerce. Relative advantage and visibility perceptions were not related to intentions to use e-commerce. For men, perceived relative advantage, compatibility, ease of use, result demonstrability, visibility and the trustworthiness of web merchants were related to intentions to use e-commerce. Having made a purchase online in the past (prior web purchase) was the best predictor of future intentions for both women and men. Table 4 provides statistics for each structural model, including standardized beta coefficients and t-statistics.

The general expectation that beliefs impact intentions to use e-commerce is supported by our analysis. However, it is apparent from Table 4 that the strength of the relationships between the innovation characteristics and use intentions vary according to gender. To further explore these differences, we tested for differences in standardized path coefficients (betas) across the two groups, using the method prescribed by Chin [2005]. This method has been used in prior IT-related studies [Ilie et al. 2005; Keil et al. 2000]. Results of this analysis are shown in Table 5. Two of the hypotheses were supported. As expected, the relative influence of relative advantage was stronger for men, while the influence of perceive compatibility was much stronger for women. No significant gender-based differences were found for the influence of ease of use, result demonstrability, visibility, image, or trustworthiness.



Table 4: Regression Equations						
Independent Variable	Women			Men		
	β	T	S.E.	β	t	S.E.
Relative Advantage	0.081	0.995	0.081	0.327	4.469***	0.073
Compatibility	0.472	6.356***	0.074	0.194	2.959***	0.066
Ease of Use	0.227	2.936**	0.077	0.117	1.604	0.073
Result Demonstrability	0.144	1.564	0.092	0.282	3.817***	0.074
Visibility	0.185	2.756**	0.067	0.145	2.572*	0.056
Image	0.070	0.902	0.071	-0.035	-0.533	0.066
Trustworthiness	0.246	3.840***	0.078	0.246	3.985***	0.062
Prior Web Purchase	0.989	6.691***	0.148	0.847	7.256***	0.117

Notes: * $p \leq .05$ ** $p \leq .01$ *** $p \leq .001$ (one-tailed)
 S.E. = Standard error

Table 5: Results of Hypothesis Tests for Beta Differences		
Hypothesis	Direction	T
H1 – Relative advantage	W < M	2.256***
H2 – Compatibility	W > M	-2.803***
H3 – Ease of use	W > M	-1.037
H4 – Result demonstrability	W < M	1.169
H5 – Visibility	W > M	-0.458
H6 – Image	W > M	-1.028
H7 – Trustworthiness	W > M	0.00

* $p \leq .10$ ** $p \leq .05$ *** $p \leq .01$ (one-tailed)

To further illustrate the beta differences (or lack thereof) associated with the hypotheses, we prepared interaction plots for each hypothesized independent variable. These are shown in Figure 2a–g; they illustrate the impact on use intentions (y-axis) for a one unit change in the independent variable (shown in the x-axis).

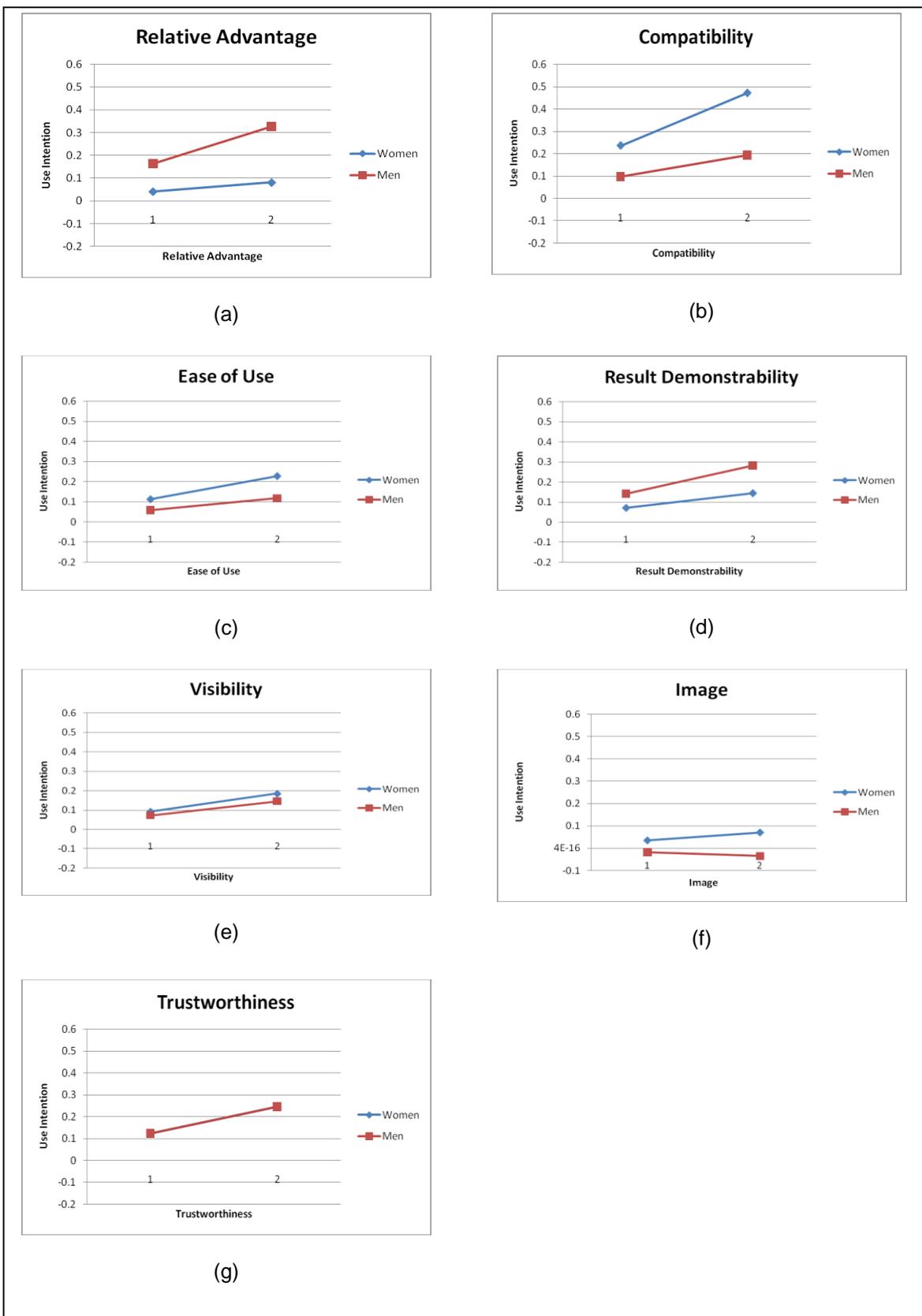


Figure 2: Interaction Plots

VI. DISCUSSION

Judging from our data, there is evidence of gender-based differences in the relative strength of factors that influence intentions to use consumer-oriented e-commerce; gender does moderate the impact of beliefs on use intentions. There is mixed support for our hypotheses, however. Relative to women, men seem to be more strongly influenced by beliefs related to the benefits of using e-commerce (relative advantage). In this study, relative advantage is primarily concerned with whether e-commerce makes purchasing products and services more efficient and effective, which is clearly related to the instrumentality of e-commerce. This seems to confirm that men are more focused on the instrumentality of e-commerce.

In addition, relative to men, women are more strongly influenced by the fit (compatibility) of e-commerce. We offer several possible explanations for our findings related to perceived compatibility beyond those discussed earlier. One possible explanation concerns the relationship between compatibility and risk. Compatibility serves to reduce the risk in adopting a new innovation. When an innovation fits well with existing values, ideas, and practices, its adoption is less risky [Rogers 2003]. As discussed earlier, men, in general, are more willing to take risks [Mitchell and Walsh 2004; Powell and Johnson 1995]. Therefore, the risk-reducing benefit of higher levels of compatibility may be less important to men, which leads to compatibility having more of an impact on use intentions for women.

On the surface, this explanation may seem at odds with our results related to trustworthiness. (Recall that no significant gender-based differences were found for the influence of trustworthiness.) Because trust and risk in the context of e-commerce are generally thought to have a relatively strong inverse relationship, the finding of no trustworthiness differences implies that there are no risk differences. However, there are multiple sources of risk related to adopting and using e-commerce. When trust and risk are investigated in the consumer e-commerce literature, they typically refer to risks related to e-commerce transactions. However, there is also risk related to the adoption decision. These two risks, while related, reflect distinct risk sources.

Transaction related risks include nonperformance, fraud, incorrect processing of the transaction, etc. In contrast, e-commerce adoption risks are either related to wasted time and effort or are affective in nature. Becoming familiar with any innovation requires time and effort; one must learn the capabilities of the innovation, how to utilize the innovation, evaluate the worth of the innovation, and so on. If an individual makes a bad adoption decision and abandons the innovation, the person's time and effort is largely without benefit. In addition, there is an affective cost related to making a bad adoption decision. If you invest the time and effort required to learn an innovation, and do not get the expected payoff, you must cognitively deal with making a bad adoption decision. Being more risk-averse in general, it may be that women are more sensitive to adoption risks than are men, and thus are more sensitive to the possible low compatibility of an innovation.

Another possible reason for the compatibility-related outcome for women is that women tend to be polychronic, meaning they prefer to engage in more than one task at a time [Kaufman-Scarborough and Lindquist 1999]. This is particularly true when combining work and social/leisure time activities [Manrai and Manrai 1995]. Polychronicity is typified by activity overlap, interruptions and dovetailing of tasks. For someone who engages in multiple tasks at a time and who tends to combine work and social activities, compatibility would be a significant criterion because compatibility eases the cognitive burden of a task, and also helps reduce the effort when changing attention from one task to another.

Several of our hypotheses were not supported. We were unable to detect significant gender-based differences in the influence of ease of use, result demonstrability, visibility, image, or trustworthiness. These results may be related to the nature of our sample. The individuals in our sample have considerable computer experience and are likely to have significant exposure to others who are heavy computer users. Interacting with merchants using a web browser may not be viewed as being especially difficult for our users, which would mitigate poor ease of use as a barrier to use. Having relatively high levels of exposure to computers and the Internet may similarly dampen the influence of visibility.

Finally, a closer examination of the results yields some interesting observations. The relative impact of each innovation characteristic on use intentions is more uniform for men than for women. For men, the standardized beta coefficients are relatively similar, when compared with the range of beta coefficients for women. In contrast, for women, although several attributes are statistically significant, one attribute (compatibility) has substantially more influence than the others. The beta coefficient for compatibility is 0.472 and the next highest is only 0.246 for trustworthiness. This suggests that, for men, any number of factors may lead them to use e-commerce but for women, although other factors are important, compatibility seems to have sufficient influence to largely determine whether they use e-commerce.

Implications

What are the implications of these findings for e-commerce merchants and website designers? It is important to keep in mind that gender is simply a surrogate for other underlying attributes. For example, men may be more willing to take risks in general, but this may not be true for a given individual. However, an organization that is attempting to design a marketing campaign may find it fruitful to focus on typical characteristics of the target population, whether women or men.

Perhaps the major implication from our study is that users are not a homogenous group; the factors that influence use intentions vary for women and men. For practitioners, this indicates that web merchants must carefully consider their target audience when designing and promoting their website. While compatibility is important for both groups, its influence is particularly strong for women. Further, for women, perceived compatibility is by far the most important determinant of use intentions; women who find online shopping incompatible may opt for other channels, despite beliefs about other characteristics of online shopping. Therefore, we recommend that web merchants pay close attention to perceptions of compatibility when attempting to attract women to their websites. This applies to the design of the site, promotions of the site, and processes supporting customer interaction. For example, web merchants may find it useful to build into their sites greater opportunities for customers to interact. This may have a positive impact on perceived compatibility for women (who view shopping as a social activity), which may in turn improve use intentions. Perhaps web merchants can develop and implement technologies that allow groups of shoppers to electronically "meet" and shop together at an online store, which would provide a more social shopping experience. In addition, echoing the suggestions of Moss et al [2006], web merchants should consider involving women in the development process for their websites.

Another message from our research is that influencing the beliefs included in our study is likely to pay dividends, regardless of whether women or men are the main target of a web merchant. While perceptions of compatibility are especially important for women, compatibility, along with ease of use, result demonstrability, and trustworthiness, is important for both men and women. Result demonstrability and visibility are both communication-related. They pertain to how well the existence (visibility) and results of consumer e-commerce can be communicated. To maximize use intentions, web merchants must be sure to clearly communicate the existence of their online stores, and the outcomes of using these stores, regardless of whether women or men are being targeted. Similar statements can be made about addressing ease of use and trustworthiness. Improving perceptions in these areas is likely to pay dividends regardless of the consumer's gender.

Our research also holds implications for researchers. First, our findings provide some validation of the idea that gender moderates the impact of beliefs on intentions in ecommerce. We believe that this is an area of research that warrants further attention. Second, our findings also indicate that it is important to look beyond the commonly researched Technology Acceptance Model components of perceived ease of use and usefulness. While ease of use was significant for both men and women, it is a relatively weak predictor of ecommerce adoption when compared to other factors. Perceived relative advantage (one component of which is usefulness) is significant for men, but not for women. Because of its parsimony, using the Technology Acceptance Model would have missed much of the nuance of our results.

Future Research

One avenue for future research is to more closely examine compatibility beliefs. This important characteristic is complex and multidimensional [Agarwal and Karahanna 1998]. The items in this study are designed to measure a general perception of fit but are not able to probe the more subtle aspects of compatibility. Knowing that compatibility is a very important characteristic for women is interesting information but in order to be genuinely useful, we need to have a more detailed understanding of this relationship.

Another area for future research pertains to the manner in which potential adopters evaluate the characteristics of an innovation. While there is considerable evidence of the importance of beliefs about an innovation's characteristics, there has been little investigation of the process by which these beliefs are formed. This area is deserving of more attention.

Our results hint at the possibility that innovation characteristic beliefs may form a hierarchy. Some innovation characteristics (compatibility and complexity) may represent barriers to adoption, while others represent the payoffs of successful adoption (relative advantage), and awareness of the innovation and its uses (visibility and result demonstrability). There is some evidence that the relative influence of innovation characteristic beliefs differ according to adoption stage (pre-adoption or continuance) [Karahanna 1999]. However, whether this is the case with e-commerce adoption is an area worthy of further investigation.

Our research (along with that of others), establishes that beliefs about the characteristics of consumer e-commerce influence use intentions. However, little research has been done to investigate what website features, design elements, and customer-interaction practices impact the various beliefs. By conducting such investigations, researchers may be able to provide concrete guidance to practitioners as to how to best impact important beliefs.

In addition, researchers may wish to build on our research by investigating differences among other groups of potential users. For example, there may be age, ethnicity, and nationality-based differences. While some IT research exists that examines group-based differences [e.g. Jarvenpaa and Tractinsky 1999; Straub et al. 1997; Van Slyke et al. 2005], more work in this area is required.

It may also be instructive to investigate the root causes of group-based differences. As stated earlier, it may be that in this context, gender is actually a surrogate for other factors, such as computer experience, knowledge or acculturation to technology. It would be interesting to discover and investigate factors that may underlie group-based differences.

VII. CONCLUSIONS

This research was motivated by a desire to better understand whether gender differences in the relative influence of e-commerce innovation characteristics exist in the decision to adopt. Although the results did not support all hypotheses, the results do provide evidence that relative advantage, compatibility, ease of use, result demonstrability, visibility, and trustworthiness affect the adoption decisions. The study also provides evidence that gender affects the relative influence of e-commerce innovation characteristics in the adoption decision. Specifically, women found compatibility to be more important than did men, while men were more influenced by relative advantage than were women. Overall, the results of this study suggest that researchers and designers can gain insight by delving deeper into the heterogeneous nature of those adopting e-commerce, investigating how different user groups have different factors that affect their decisions to adopt e-commerce initiatives. By doing this, organizations can provide even stronger e-commerce initiatives that can be adopted by an ever-growing customer base.

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APPENDIX: SCALE ITEMS

Construct	Scale Items
Relative Advantage	<ol style="list-style-type: none"> 1. Using the web enhances my effectiveness in purchasing products or services. 2. Using the web makes it easier to purchase products or services. 3. Using the web gives me greater control over my purchasing products or services.
Use Intentions	<ol style="list-style-type: none"> 1. I would use the web for purchasing a product or service. 2. Buying a product or service over the web is something I would do. 3. I could see myself using the web to buy a product or service.
Compatibility	<ol style="list-style-type: none"> 1. I think that using the web fits well with the way I like to purchase products or services. 2. Using the web fits into my purchasing style. 3. Using the web to purchase products or services is compatible with how I like to do things.
Ease of Use	<ol style="list-style-type: none"> 1. Learning to use the web for purchasing products or services is easy for me. 2. I believe that it is easy to get the web to do what I want it to do. 3. Interacting with the web to purchase products or services is clear and understandable. 4. Overall, I believe that using the web to purchase products or services is easy.
Result Demonstrability	<ol style="list-style-type: none"> 1. I would have difficulty explaining why using the web to purchase products or services may or may not be beneficial.* 2. I would have no difficulty telling others about the results of using the web to purchase products or services. 3. I believe I could communicate to others the consequences of using the web to purchase products or services. 4. The results of using the web to purchase products or services are apparent to me.
Visibility	<ol style="list-style-type: none"> 1. Purchasing products or services over the web is not very visible.* 2. I have seen many people purchasing products or services over the web.
Image	<ol style="list-style-type: none"> 1. People who use the web to purchase products or services have a high profile. 2. People who use the web to purchase products or services have more prestige than those who do not. 3. Purchasing products or services over the web is a status symbol.
Trustworthiness of Web Merchants	<ol style="list-style-type: none"> 1. I think you can trust web merchants. 2. Web merchants can be trusted to carry out transactions faithfully. 3. In my opinion, web merchants are trustworthy.

- Notes:
1. Each question was followed by a scale of 1 to 7 (Strongly Disagree to Neutral to Strongly Agree).
 2. Questions were randomly listed on survey instrument.
 3. * indicates reverse worded item

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