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Original Research

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Abstract

Designing websites that are responsive to customer needs is a critical prerequisite for the success of online services. To date, much research has focused on understanding which design requirements can be successfully applied to a website's design. However, there has been limited research examining why some requirements may have more or less importance to customers. In addition to demographic characteristics, we propose that psychographic characteristics influence usability-related requirements. To develop our research model and hypotheses, we draw from usability literature and research in consumer behavior concerned with customers' prevailing beliefs about technology. Conceptualizing customer beliefs should not only help distinguish between positive and negative processes but also help further investigate their consequences. To explore the relationship between customer characteristics (i.e., gender and technology beliefs) and usability requirements, we use a usability procedure based on the Microsoft Usability Guidelines (MUG). MUG identifies multiple design requirements that are expected to increase the usability of sites. We present the results of our study involving 215 participants. Overall, our results suggest that negative beliefs may play a larger role in influencing usability requirements than positive beliefs. And, the results suggest that prior Web experience moderates the relationship between beliefs and requirements.

Keywords: Customer Interface, Usability, Demographics, Psychographics, Technology Beliefs, Technology Readiness, Utilitarian Websites, Laboratory Experiment

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INTRODUCTION

Online services have transformed entire industries, ranging from banking to health to news among many others. American adults alone report using the Internet for an ever-increasing array of activities, many of which are characterized as self-service. Over 80% check the weather, seek directions or look for information on health or hobbies; over 70% conduct product research online (e.g., comparing prices, reading reviews) and read news; and, nearly 65% of adults make travel reservations and bank online.[1] Ultimately, the success of these online services in terms of customer attraction and retention is largely determined by the customer experience via the interface. The interface provides a mechanism for customers to browse, search for/access content, share information, conduct transactions, and interact with others (Chau et al., 2002; Valacich et al., 2007; Zhang and von Dran, 2002). Prior research suggests that the usability of the interface is a key driver of the use of online services (Lohse and Spiller, 1998; Massey et al., 2007; Nielsen, 1999; Venkatesh and Agarwal, 2006).

Usability is the ease with which an online user can employ a website interface to achieve a specific goal. The experience via the interface must satisfy both sensory and functional needs (Massey et al., 2007; Palmer, 2002; Valacich et al., 2007). While largely based on heuristics, a variety of design suggestions for website usability can be found in the academic literature and trade press (e.g., Ballard and Miller, 2001; Cunliffe, 2000; Karkkainen and Laarni, 2002; Keeker, 1997; Lam and Lee, 1999; Nielsen, 2000). Agarwal and Venkatesh (2002) proposed a usability evaluation procedure based on the Microsoft Usability Guidelines (MUG; see Keeker, 1997). MUG identifies design requirements that should increase usability. While MUG provides procedures for usability evaluation, there has been little research examining *why* online customers would place more or less importance on any of the design requirements. Additional research is needed to better understand the relationship between customer characteristics and usability requirements such that the needs of diverse customers can be met via the interface.

This study examines both demographic and psychographic characteristics in an attempt to better understand customer usability requirements. We set our study in the context of online service websites – more specifically, utilitarian sites providing instrumental value to customers. Extensive research addresses the influence of demographics on usability (Hawkins et al., 1995; Venkatesh and Agarwal, 2006; Venkatesh and Venkataraman, 2006), but psychographics have attracted less attention. While demographics are facts that are static or change linearly over time, psychographics can be more dynamic as they seek to describe customers along psychological dimensions (Demby, 2011; Wells, 1975). Here, we are specifically interested in how a customer's fundamental positive and negative *beliefs about technology* may influence the weights placed on different usability requirements. We draw upon research in consumer behavior that has investigated beliefs about technology (e.g., Cowles, 1989; Cowles and Crosby, 1990; Dabholkar, 1996; Mick and Fournier, 1998; Parasuraman, 2000; Parasuraman and Colby, 2001). We focus specifically on research related to *Technology Readiness* (TR) – the propensity to embrace and use new technologies for accomplishing goals (Parasuraman and Colby, 2001). TR reflects both positive (i.e., *optimism* and *innovativeness*) and negative (i.e., *discomfort* and *insecurity*) beliefs that may influence customers' usability requirements. Our research specifically examines the influence of TR beliefs, as well as gender, on usability requirements.

In the following sections, we review the relevant literature and develop our research model and hypotheses. We then describe our methods and discuss the results of our empirical study. We conclude with a discussion of limitations and future directions.

BACKGROUND LITERATURE

Human computer interaction (HCI) research has focused on how to work with and improve the usability of interactive systems (Hornbaek, 2006). Usability may be defined as the extent to which "a product [online service] can be used by specific users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use" (Karat, 1997 p. 34). Importantly, some usability issues may be more or less relevant depending on use context (e.g., enterprise system, mobile application, website interface, etc.) (Hornbaek, 2006; Maguire, 2001). Given this, researchers have examined a variety of topics, including methods to predict usability problems (Molich and Nielsen, 1990) and ways to conduct usability evaluations (Hornbaek, 2006; Hwang and Salvendy, 2009). In fact, a number of approaches to evaluation have been suggested. These approaches comprise a broad range of interface design issues such as a site's security and performance (e.g., response time), affordances that help customers interact with a site (e.g., ease of navigation), and general graphic design (e.g., color, audio/visual) (Palmer, 2002; Valacich et al., 2007; Zhang and von Dran, 2002).

[1] Pew Internet & American Life Project http://www.pewinternet.org/Static-Pages/Trend-Data-(Adults)/Online-Activites-Total.aspx (viewed on 1June 2013).

In this paper, we focus our attention on website usability and deploy an approach (Agarwal and Venkatesh, 2002; Venkatesh et al., 2003b; Venkatesh and Venkataraman, 2006) based on the Microsoft Usability Guidelines (MUG; see Keeker, 1997). Research has shown MUG effectively captures website usability and has been linked to use behavior, purchase behavior, and site use (Venkatesh and Agarwal, 2006; Venkatesh and Venkataraman, 2006). MUG identifies five website design requirements: content, ease of use, made-for-the-medium, emotion, and promotion. Content refers to the extent to which a website offers informational and transactional capability (e.g., relevance and timeliness). Ease of use refers to the extent to which a website is "free of effort" (e.g., easy navigation). Made-for-the-medium refers to the extent to which a website can be tailored to fit specific needs of users (e.g., personalization). Emotion refers to the extent to which a website evokes emotional reactions (e.g., ability to control the pace of information). Finally, promotion refers to the extent to which a site is well promoted on the Internet or through other media (e.g., TV, magazines). Under MUG, and using a constant sum approach, individuals assign weights by distributing 100 points across each of the design requirements. This activity is not an assessment of a specific website; rather, it indicates which usability requirements are more (or less) important to a particular user.

Results of prior research suggest that the relative importance of MUG's usability requirements may vary due to use context such as access method (i.e., PC vs. mobile device) or online site type (i.e., utilitarian vs. hedonic) (e.g., Agarwal and Venkatesh, 2002; Venkatesh and Agarwal, 2006; Venkatesh et al., 2003b; Venkatesh and Venkataraman, 2006). In an online environment, websites deliver services to customers and often serve as the primary window through which customers interact with the organization (Zhang and von Dran, 2002). While design features can be manipulated to achieve a "high quality" website, organizations must first understand who uses the site, why, and what they expect. However, research regarding the importance of specific usability requirements (including those found in MUG) across different online users has been limited (Valacich et al., 2007; Zhang and von Dran, 2002). Prior research in IS and marketing theorizes about the effects of various demographic variables (e.g., age, gender, income) on technology-related behaviors (Venkatesh et al., 2003a) and customer choice (Morton et al., 2001). For example, research suggests that usability requirements differ based on age and gender (Venkatesh and Agarwal, 2006; Venkatesh and Venkataraman, 2006). However, while demographics often correlate with customers' needs, it is unlikely that demographics alone explain differences in usability requirements. Since they are simply objective descriptions of customers, they cannot explain distinctly non-demographic differences between individuals (e.g., attitudinal, affective, or cognitive differences). In contrast, characterizing customers based on psychological dimensions provides insight into underlying beliefs, thus explaining "why" they react or behave in certain ways (Wells, 1975; Wells and Tigert, 1971). In practice, psychographics and demographics are often combined to develop a more "lifelike" profile of customers. These profiles can then inform the development of new products and services and product/service positioning strategies (Ailawadi et al., 2001; Gilbert and Warren, 1995; Heath, 1996; Mitchell, 1994).

Prior research has shown that both positive and negative customer beliefs about technology correlate with perceptions about and/or acceptance of technology-based products or services (Cowles, 1989; Cowles and Crosby, 1990; Dabholkar, 1994; Davis et al., 1989; Mick and Fournier, 1998). In examining people-technology interactions, Mick and Fournier (1998) identified multiple technology paradoxes that users must cope with. For example, the control/chaos paradox suggests that technology can facilitate regulation and order or lead to upheaval and disorder. As this example implies, technology can simultaneously trigger positive and negative feelings, and the relative dominance of feelings varies across individuals. Despite the interest in psychographic beliefs in psychology and consumer marketing, there has been little effort to examine the impact of such beliefs on usability, particularly with regard to how consumers experience online service interfaces.

In positing a link between psychographic beliefs and usability, we employ the concept of Technology Readiness (TR) (Parasuraman, 2000). TR has been applied to a number of contexts from consumer marketing (Parasuraman and Grewal, 2000) to health care research (Rosen et al., 2003). TR reflects four technology beliefs related to a customer's propensity to embrace and use technology-based products and services (Lin et al., 2007; Walczuch et al., 2007). Two beliefs – optimism and innovativeness – contribute to TR, while the other two – discomfort and insecurity – inhibit TR. Briefly, optimism is a positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives. Innovativeness reflects the extent to which one believes s/he is at the leading edge of trying out new technology-based products or services. Discomfort is a perceived lack of control over technology and a feeling of being overwhelmed by it. Here, individuals believe technology is not really designed for use by ordinary people and is simply too complicated. Lastly, insecurity reflects an inherent distrust of technology and doubt about its ability to work properly.

The degree to which an individual holds one (or more) of these beliefs to be important anchors the individual's behavior related to that belief (Ajzen and Madden, 1986). Research on psychographic beliefs and technology acceptance may help us understand other types of behavior including those related to online experiences (Brown et al., 2004; Jarvenpaa et al., 1998; Venkatesh, 2000). For example, prior research found that different TR segments (e.g., Explorers and Skeptics) vary in usability requirements. In our current work, we seek to add to this stream by examining relationships not at the segment level, but at a more nuanced belief level (i.e., optimism, innovativeness, discomfort, and insecurity). For example, we posit that individuals with stronger negative beliefs may seek to mitigate anxiety and distrust when interacting with technology such as a website. Thus, these individuals will place greater

emphasis on usability requirements that help allay their negative beliefs. In the following section, we develop this perspective further by offering our research model and specific hypotheses regarding the relationships between customer characteristics and usability requirements (Massey et al., 2007).

MODEL AND HYPOTHESES

Our research model is shown in Figure 1. We expect that customer characteristics will influence the relative importance of various usability requirements. While our consideration of gender is informed by extant literature, less literature exists regarding the link between psychographic beliefs and usability requirements. As shown, we expect these relationships to be moderated by prior Web experience.

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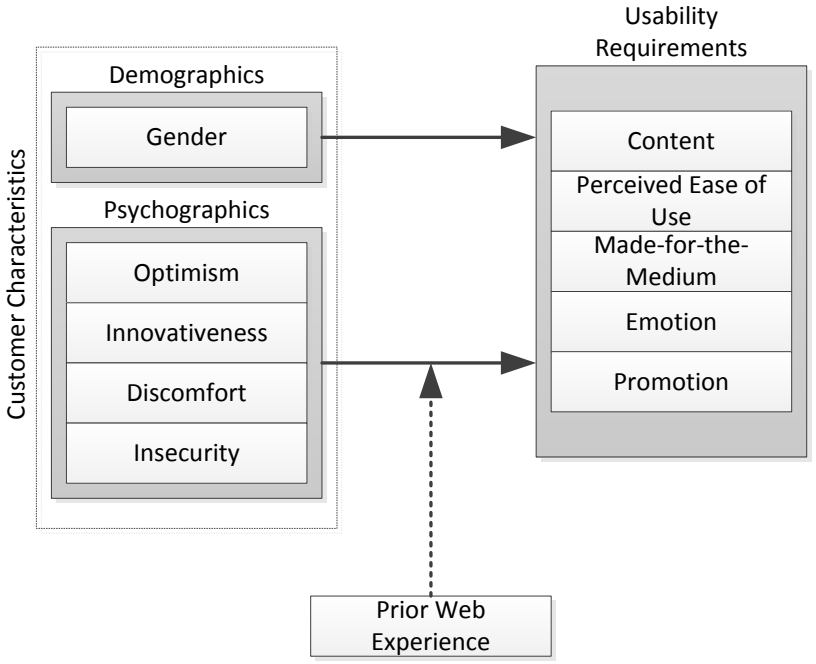

Figure 1: Research Model

Demographic Characteristics

A body of IS and marketing research has shown demographics, and gender in particular, to be related to technology and consumer-related behaviors (Morton et al., 2001; Venkatesh et al., 2003a). Psychology and sociology research has found differences in how males and females process information (e.g., Grön et al., 2000; McGivern et al., 1997; Wrase et al., 2003). However, few studies have attempted to examine gender differences in the usability literature. One exception is a qualitative study in which males systematically reported websites as easier to navigate than females; in this study, women were more likely to report affective reactions to colors and designs, while men reported flashy animations as useful in determining usability (Cyr and Bonanni, 2005).

While research on gender and usability is somewhat limited, results are consistent with information processing models. One such model is the selectivity model which suggests that males often do not engage in comprehensive processing of information; rather they are selective and employ heuristics and miss subtle cues. In contrast, females generally use comprehensive processing strategies and respond to subtle cues (Darley and Smith, 1995). Prior research using MUG has found that content and made-for-the-medium attributes were more important to men than women (Pearson and Pearson, 2008; Venkatesh and Agarwal, 2006). Content reflects the relevance and timeliness of the information, providing males the means to selectively process information. Furthermore, made-for-the-medium allows males to tailor a website to their specific needs, thus allowing modification of the website to conform to their more selective heuristics. Therefore, based on the selectivity model and prior findings, we also expect that males will place relatively more importance on content and made-for-the-medium than females.

Similarly, perceived ease of use and emotion were previously found to be relatively more important to females than males (Venkatesh and Agarwal, 2006). Again, according to the selectivity model, females are comprehensive information processors (Darley and Smith, 1995). Given this, we posit that females place a relatively higher importance on the effort required to gather desired information. Moreover, since females tend to exhibit greater

sensitivity to the particulars of presented information, including emotional appeal and community building activities (Smith and Whitlark, 2001), we expect they will place a higher relative importance on emotion than males. Lastly, Venkatesh and Agarwal (2006) found no gender difference in the relative importance placed on promotion. Since promotion does not interact with the way the information on a website is processed, we do not expect any difference. Stated formally:

> *H1. Gender will influence usability requirements such that (i) content and made-for-the-medium will be more important to men, (ii) perceived ease of use and emotion will be more important to women, and (iii) promotion will be equally important.*

Psychographic Characteristics

Drawing from the literature concerned with psychographic beliefs (TR) and technology acceptance, we expect that underlying TR beliefs (i.e., optimism, innovativeness, discomfort, and insecurity) will have differential relative effects on usability requirements. While various combinations of beliefs can be used to segment customers (Parasuraman and Colby, 2001) and prior work has explored the relationship between TR segments and usability (Massey et al., 2007), our interest is in examining the unique influence of the four beliefs on usability requirements. We assert that each belief about technology consequently influences one's behavior when interacting with a website. In turn, this creates specific demands regarding the usability requirements of the individual.

As defined earlier, optimism reflects a positive view of technology and a belief that it offers one increased control, convenience, and efficiency (Parasuraman, 2000). Control is an important factor for consumers when interacting with online sites (Koufaris, 2001). Made-for-the-medium allows for tailoring a website to fit one's needs. Thus, the ability to personalize the online experience may satisfy the desire for control and move the online experience from a common, static environment to a unique, dynamic environment created for the individual (Tsikriktsis, 2004). This ability also provides convenience and enhanced efficiency (Agarwal and Venkatesh, 2002). Optimistic customers who believe technology serves their desire for convenience and efficiency are also more likely to place a greater emphasis on perceived ease of use. For example, people may like to read news or shop online because they can do so whenever they want – not only is this convenient, it requires less effort and is more efficient than the traditional experience, particularly if the site can be personalized. Emotion, the affective response to a website, can be evoked via an emotional appeal or the overall hedonic nature of the website (Venkatesh and Agarwal, 2006). Optimistic individuals are high in positive affect and actively seek positive mental states (Emmons, 1986). Since emotional appeals on websites are designed to evoke positive consumer reactions, we expect emotional content of the website may be valued more by optimistic users. The ability to control pace through the website further satisfies both the desire for control and efficiency. Thus, we expect perceived ease of use, made-for-the-medium, and emotion to serve the desires of optimistic users. In contrast, since content describes the relevance and timeliness of information on the website, we expect it to be important to all users; that is, we do not expect optimistic users to place relatively more importance on content. Similarly, since promotion describes how well a website is promoted over the Internet or other media, we do not expect optimistic customers, who primarily value efficiency and control, to place relatively more importance on promotion. Stated formally:

> *H2a. Optimism will influence usability requirements such that (i) perceived ease of use, made-for-the-medium, and emotion will be more important for users high on optimism, and (ii) content and promotion will be equally important.*

Innovativeness addresses the extent to which an individual believes s/he is at the leading edge of trying out new technology-based products or services. Kirton (1989) defined cognitive styles as existing on a continuum from "adaptive" to "innovative." Innovators place value on the ability to complete tasks in their own way, learn new technology on their own, and tend to focus on its benefits (Parasuraman, 2000). In concert, this suggests that innovativeness is most closely tied to the usability dimensions of content (e.g., relevance, perceived usefulness) and made-for-the-medium (e.g., personalization) (Venkatesh and Venkataraman, 2006). Overall, both dimensions satisfy an innovative user by allowing them to access relevant information as desired (Hamilton and Chervany, 1981). Karahanna et al. (1999) also found similar results in which technology users were more concerned with perceived usefulness than how easy the technology was to use. In contrast, since innovative customers want to "figure things out" for themselves and tend to value the practical aspects of websites (Kirton, 1989), we do not expect they will emphasize perceived ease of use or emotion. Furthermore, since they are on the leading edge of technology, they will not emphasize promotion as they tend not be swayed by other sources (Parasuraman, 2000). Stated formally:

> *H2b. Innovativeness will influence usability requirements such that (i) content and made-for-the-medium will be more important to users high on innovativeness, and (ii) perceived ease of use, emotion, and promotion will be equally important.*

Discomfort is a perceived lack of control over technology and a feeling of being overwhelmed by it. Individuals high on discomfort believe technology is not really designed for use by an average person and is simply too complicated

(Parasuraman, 2000). This specific belief is associated with technology anxiety, defined as "the user's state of mind regarding their ability and willingness to use technology-related tools" (Meuter et al., 2003 p. 900). Meuter et al.'s research on self-service technologies found that technology anxiety affects Internet usage. To mitigate anxiety, they suggest maximizing the relevance of a given task while minimizing the technological complexities. Anxiety mitigation should cause a user to place relatively more importance on content (i.e., by delivering the right depth and breadth so as not to overwhelm a customer) (Hamilton and Chervany, 1981). From a technology adoption perspective, similar research on computer anxiety found a direct, negative effect on perceived ease of use as well (Hackbarth et al., 2003; Venkatesh, 2000). Furthermore, perceived ease of use (i.e., structure and feedback) has been shown to mitigate discomfiture (Walczuch et al., 2007). Given the need to reduce anxiety, we expect both content and perceived ease of use to be relatively more important than the other usability requirements. In contrast, we do not expect discomfort to lead a customer to emphasize made-for-the-medium, emotion, or promotion. We expect that all users, and not just users high on discomfort, will give importance to control over technology, both the amount of information that is presented to them (i.e., made-for-the-medium) as well as pace at which information is provided to them (i.e., emotion). Similarly, promotion does not provide enhanced control of websites or make them less complicated. That is why we expect discomfort not to influence made-for-the-medium, emotion, and promotion. Stated formally:

> *H2c. Discomfort will influence usability requirements such that (i) content and perceived ease of use will be more important to users high on discomfort, and (ii) made-for-the-medium, emotion, and promotion will be equally important.*

Lastly, *insecurity* reflects an inherent distrust of technology and a sense of apprehensiveness. Insecure individuals tend to be concerned about where their information is going or who will see it, particularly in electronic transactions (Parasuraman, 2000). Insecurity is different from discomfort as this dimension focuses more on specific aspects of technology compared to the general feelings towards technology captured through discomfort (Tsikriktsis, 2004). Insecure individuals may require higher levels of trust to mitigate (perceived or real) risks and uncertainty inherent in online transactions (McKnight et al., 2002). Trust has been studied extensively in the IS literature, with studies examining trust as a function of perceived privacy, security, and integrity of system design (Casalo et al., 2007; Flavián et al., 2006). Of the usability requirements, we expect the ability to personalize a site via made-for-the-medium and the assurance offered via promotion to be most related to insecure beliefs. For example, the ability to tailor information received from the website may help mitigate distrust. And, assurance as to the site's veracity, gleaned through the promotion of the site on the Internet or via other platforms/media, may also be important. For example, online customers of electronic newspapers may feel more secure due to traditional experiences with the print newspaper. The results of prior research also suggest promotion can mitigate insecurity (Massey et al., 2007). In contrast, we do not expect insecurity to lead a customer to emphasize content, perceived ease of use, or emotion. Neither informational and transactional content nor perceived ease of use (e.g., efficiency) provides customers with ways to mitigate insecurity. And, since insecure customers tend to be concerned with practical aspects such as security, we do not expect they will place more emphasis on emotional dimensions. Stated formally:

> *H2d. Insecurity will influence usability requirements such that (i) made-for-the-medium and promotion will be more important for users high on insecurity, and (ii) content, perceived ease of use, and emotion will be equally important.*

In addition to demographic and psychographic characteristics, past research suggests that prior experiences strongly influence future needs and behaviors (Celci and Olson, 1988; Hoch and Deighton, 1989; Petersen et al., 2002). Within HCI, empirical evidence has shown that a user's level of technology experience plays a key role in subsequent artifact use, often changing needs, behaviors and attitudes (Card et al., 1983). Certain characteristics of websites have been tied to affective psychological responses. For example, for an inexperienced user, a website's visual complexity was found to induce greater negative affectivity (Tuch et al., 2009).

Since experience reflects the phenomenon of personally observing, encountering, or undergoing something, it may help distinguish the value of demographic and psychographic characteristics. That is, a psychographic belief is a descriptive thought one holds about something. Thus, unlike a demographic variable, the belief can be altered through experience with that something (Kotler and Armstrong, 1999). As a user gains experience with an interface, we believe that his/her positive beliefs will play a decreased role in determining usability requirements. With regard to negative beliefs, prior experience with a technology has been shown to lessen discomfiture and mitigate anxiety (Carey et al., 2008; Liu et al., 1992). Thus, as the user gains experience with an interface, negative beliefs will play a decreased role in determining his/her usability requirements. Stated formally:

> *H3. Prior Web experience will attenuate the effects of positive and negative beliefs on usability requirements.*

METHOD

To test our research hypotheses, 215 subjects were recruited from a campus of a large university in the U.S.

Participation was voluntary and subjects received a $20 award for their participation.

Subjects completed a survey to measure their technology beliefs. We adapted Parasuraman's (2000) fifteen Likert-scaled items to measure the four technology beliefs (1 = strongly disagree to 5 = strongly agree). The items are reported in Appendix A. Subjects were given descriptions of the five usability design requirements, and to provide a use context, they were informed that the focus of the study was the design of online services such as news, maps, restaurant guides, etc. For users, such sites/services tend to be considered utilitarian (i.e., providing some instrumental value) as opposed to hedonic (i.e., providing self-fulfilling or pleasurable value) in nature (van der Heijden, 2004). To leverage the full functionality of these sites, they also often call for the user to share information with the site (e.g., current location). Following MUG procedures (Agarwal and Venkatesh, 2002), each subject was instructed to distribute 100 points across the five usability requirements, thus reflecting the relative importance (i.e., weight) of each design requirement to the subject. The instructions are provided in Appendix B.

In terms of age, 69.3% of our subjects were between 18-25 years old, 25.6% were 26-35, and 5.1% were over 35. Female respondents comprised 39.1% of the sample; 4.7% were undergraduate students, 92% were graduate students, and 3.3% were non-student university employees. We also collected data on individuals' prior experience using the Web on a daily basis for utilitarian purposes (1= never to 4 = frequently) (Kraut et al., 1999; O'Keefe et al., 2000). The average prior Web experience was 2.73.

Analysis and Results

Our analysis was conducted in two steps: (1) a factor analysis of the psychographic belief measures, and (2) a series of seemingly unrelated regression (SURE) analyses for testing the hypotheses.

First, we conducted exploratory factor analysis with varimax rotation to identify items with higher loadings for each factor. All constructs had reliability greater than $\alpha = 0.70$ (Fornell and Larcker, 1981), except for optimism at $\alpha = 0.64$[2] (see Table 1). We tested convergent and discriminant validity of the items by examining whether all items loaded highly on their respective constructs. While some of our items had a loading lower than the recommended value of 0.70, we chose to retain the items with lower loadings in order to preserve the integrity of the original research design in our analysis (e.g., Barclay et al., 1995; Yoo and Alavi, 2001). To further verify the dimensional structure shown in Table 1, a confirmatory factor analysis was conducted using LISREL 8.80. This analysis indicated that the model fit the data well. Although the model produced a significant chi-square value ($p < .01$), this could be an artifact of the sample size (Bagozzi and Yi, 1988). The goodness-of-fit statistics indicated good fit (*GFI* = 0.91; *NNFI* = 0.95; *CFI* = 0.96); although with acceptable but moderate error (*RMSR* = .08).

Table 1. Factor Loadings after Varimax Rotation[3]

Item	Optimism	Innovativeness	Insecurity	Discomfort
OPT1	0.67	-0.11	0.11	-0.03
OPT2	0.65	0.07	-0.28	0.06
OPT3	0.64	0.20	0.01	-0.45
OPT4	0.75	0.22	0.05	0.05
INN1	0.12	0.82	-0.11	-0.04
INN2	0.05	0.78	-0.19	-0.21
INN3	0.07	0.79	0.09	-0.27
INN4	0.04	0.78	-0.01	-0.23
INS1	-0.19	-0.05	0.80	-0.10
INS2	-0.04	-0.28	0.64	0.43
INS3	0.07	-0.16	0.66	0.33
INS4	0.13	-0.03	0.68	0.30
DIS1	0.07	-0.30	0.12	0.75
DIS2	-0.06	-0.12	0.27	0.73
DIS3	-0.12	-0.38	0.21	0.59
Cronbach's alpha	0.64	0.85	0.75	0.71

In Table 2 and Table 3, we present summary statistics of participants' psychographic and demographic characteristics and usability requirements. As shown, subjects' positive beliefs were higher than their negative beliefs, and they were

[2] The generally agreed upon lower limit for Cronbach's alpha is .70, although it may be decreased to .60 in exploratory research (Nunnally, 1967; Robinson, et al., 1991).
[3] Item labels correspond to those shown in Appendix A. All numbers (except Cronbach's alphas) are factor loadings multiplied by 100.

more optimistic than innovative. The respondents distributed 100 points across the different usability requirements and, on average, gave emotion and promotion only 8.53 and 8.26 points, respectively. Consistent with past research (e.g., Agarwal and Venkatesh, 2002; Massey et al., 2007; Venkatesh and Agarwal, 2006; Venkatesh and Venkataraman, 2006), subjects overall placed less importance on emotion and promotion than on the other usability requirements.

In the second stage of analysis, we tested our hypotheses in a system of five *seemingly unrelated regression estimation* (SURE) models to maximize the efficiency of the estimation (Johnston, 1984). SURE is a statistical technique that solves a set of regression equations simultaneously and allows error covariance among the equations. Given the constant sum approach wherein subjects distributed 100 points among different usability requirements, the error terms in five equations were correlated. Thus, SURE analysis was appropriate for this study.

Table 2. Descriptive Statistics

	Mean	SD
Optimism (OPT) [4]	4.08	0.62
Innovativeness (INN)	3.27	0.99
Insecurity (INS)	3.06	0.93
Discomfort (DIS)	3.07	0.91
Content (CON)	38.28	12.89
Ease-of-Use (EOU)	29.63	10.07
Made-for-the-Medium (MFM)	15.35	8.17
Emotion (EMO)	8.53	5.84
Promotion (PRO)	8.26	6.39
Prior Web experience (EXP)	2.73	0.46
Age (AGE)	18-25: 149 26-35:55 36-45: 10 > 45: 1	NA
Gender (GEN)	Male: 131 Female: 84	NA

Table 3. Correlations

	OPT	INN	INS	DIS	CON	EOU	MFM	EMO	PRO	EXP	AGE	GEN
Optimism (OPT)	1.00											
Innovative-ness (INN)	0.26***	1.00										
Insecurity (INS)	-0.12*	-0.36***	1.00									
Discomfort (DIS)	-0.21***	-0.54***	0.54***	1.00								
Content (CON)	-0.02	0.00	-0.13*	0.09	1.00							
Ease-of-Use (EOU)	0.07	-0.07	0.02	-0.15**	-0.41***	1.00						
Made-for-the-Medium (MFM)	-0.05	0.10	0.13*	0.03	-0.48***	-0.22***	1.00					
Emotion (EMO)	0.02	0.00	0.07	0.04	-0.44***	-0.26***	0.11	1.00				
Promotion (PRO)	-0.05	-0.04	0.06	-0.03	-0.36***	-0.23***	-0.08	0.24***	1.00			
Prior Web experience (EXP)	0.25***	0.23***	-0.01	0.00	0.17**	-0.20***	-0.10	-0.03	0.12	1.00		
Age (AGE)	0.04	0.04	-0.12**	-0.10*	0.08	0.01	0.04	-0.12**	-0.06	0.04	1.00	
Gender (GEN)	0.04	-0.11**	-0.08	0.01	0.04	0.09	-0.12**	-0.09	-0.05	-0.07	0.10	1.00

*** significant at $p < 0.01$; ** significant at $p < 0.05$; * significant at $p < 0.1$

[4] Means for the psychographic beliefs (OPT, INN, INS and DIS) reflect a 5-point scale (1=strongly disagree to 5=strongly agree). All correlations entries are Pearson correlations except AGE and GEN where the correlation entries are Kendall's Tau-b.

Each SURE analysis involved five equations, with the usability requirements (content, perceived ease of use, made-for-the-medium, emotion, and promotion) as the dependent variables. Based on prior research, our baseline SURE model only included gender and prior Web experience as predictors and age as a control variable (see Model 1 in Appendix C). In the second SURE model, we included gender, prior Web experience and the four technology beliefs as predictors and age as a control variable (see Model 2 in Appendix D). Finally, in the third SURE model, we added an interaction term (prior Web experience and each of four psychographic beliefs) considering that Web experience was a significant predictor in the baseline model (Model 1). The moderated SURE model tests whether the influence of the psychographic beliefs on usability requirements differs based on prior Web experience. Comparative model analyses indicated that the hypothesized moderated model structure (Model 3) had explanatory power superior to Model 2 or Model 1 for the three most important usability requirements (content, perceived ease of use and made-for-the-medium). The final results, shown in Table 4, provide mixed support for our hypotheses. As noted earlier, past research has consistently found the usability requirements of emotion and promotion to be less important to users. Similarly here, since the overall *F*-tests for requirements related to emotion and promotion were not significant, we did not consider them further.

With regard to the demographic of gender, our results show no effect on any of the hypothesized relationships of gender to usability requirements. Thus, contrary to expectations and prior research, H1 is not supported.

Table 4. SURE Results: Standardized Regression Coefficients

	Dependent Variables				
Independent Variables	Content	EOU	MFM	Emotion	Promotion
Intercept	0.00 (52.35)	0.00 (40.96)	0.00 (33.76)	0.00 (24.82)	0.00 (26.75)
Gender	0.03 (1.80)	0.08 (1.40)	-0.05 (1.16)	-0.07 (0.85)	-0.03 (0.92)
Age	0.11 (1.47)	-0.02 (1.15)	0.02 (0.95)	-0.12* (0.70)	-0.11 (0.75)
Prior Web experience (EXP)	0.11 (19.26)	0.82 (15.07)	-1.11 (12.42)	-0.11 (9.13)	0.08 (9.84)
Optimism	-0.36 (9.28)	0.87** (7.26)	-0.61 (5.98)	0.23 (4.40)	-0.04 (4.74)
Innovativeness	0.78 (6.39)	-0.42 (5.00)	-0.27 (4.12)	-0.41 (3.03)	-0.18 (3.27)
Discomfort	1.14** (7.86)	0.26 (6.15)	-0.90 (5.07)	-0.65 (3.73)	-0.94* (4.02)
Insecurity	-1.39*** (7.54)	0.15 (5.91)	1.03* (4.87)	0.63 (3.58)	0.68 (3.86)
EXP*Optimism	0.52 (3.42)	-1.26* (2.68)	0.96 (2.21)	-0.33 (1.62)	-0.07 (1.75)
EXP*Innovativeness	-0.98 (2.35)	0.34 (1.83)	0.64 (1.51)	0.56 (1.11)	0.09 (1.20)
EXP*Discomfort	-1.15* (2.89)	-0.58 (2.24)	1.18* (1.86)	0.83 (1.37)	0.95 (1.48)
EXP*Insecurity	1.39** (2.77)	-0.06 (2.17)	-1.04 (1.79)	-0.71 (1.31)	-0.72 (1.42)
R^2	0.12 F=2.55***	0.12 F=2.49***	0.09 F=1.84**	0.04 F=0.75	0.07 F=1.29

Standardized coefficients are shown, with standard errors in parentheses.
***significant at p < 0.01; **significant at p < 0.05; *significant at p < 0.1

With regard to the psychographic characteristics, for *optimism*, the standardized regression coefficient indicates that this belief is positively related to the importance given to perceived ease of use. That is, perceived ease of use is more important for users high on optimism. Contrary to expectations, optimism is not related to the importance of made-for-the-medium or emotion. Thus, H2a is partially supported. For *innovativeness*, the results in Table 4 show that none of the coefficients are significant. Thus, H2b is not supported. For *discomfort*, consistent with our expectation, the results indicate that this belief is positively related to the importance placed on content. However, it is not related to perceived ease of use. Thus, H2c is partially supported. Finally, for *insecurity*, the results indicate that made-for-the-medium is important to users high in insecurity, while promotion is not. Thus, H2d is partially supported. Interestingly, insecurity is also significantly related to the importance placed on content – specifically, those who possess higher levels of insecurity place significantly *less* emphasis on content as a usability requirement.

Our results indicate that prior Web experience has a significant moderating effect on the influence of optimism on the

importance placed on perceived ease of use – that is, more experience reduced the importance of this requirement. Our results indicate that prior Web experience, also as expected, lessened the effect of discomfort on the importance placed on content. However, contrary to our expectations, for discomfort and insecurity, rather than lessening effects, prior Web experience increased the importance placed on made-for-the-medium and content, respectively. Thus, H3 is partially supported.

We summarize our findings in Table 5. In general, the results suggest that both positive (optimism and innovativeness) and negative (discomfort and insecurity) beliefs influence the importance that individuals give to different usability requirements. Our findings also suggest that prior Web experience moderates the effects of beliefs on usability requirements, in particular content, perceived ease of use and made-for-the-medium.

Table 5. Summary of Hypotheses Testing

Hypotheses	Support for hypotheses	Key Findings
H1	Not supported	Effect of a Demographic Characteristic • Gender did not influence any usability requirements.
H2	Partially supported	Effect of Psychographics Characteristics • Perceived ease of use is more important for users high on optimism. • Innovativeness does not influence any usability requirements. • Content is more important for users high on discomfort. • Content and made-for-the-medium are more important for users high on insecurity.
H3	Partially supported	Moderating Effects of Prior Experience • Prior Web experience decreases the effect of optimism on the importance placed on perceived ease of use. • Prior Web experience decreases the effect of discomfort on the importance placed on content, but increases the importance placed on made-for-the-medium. • Prior Web experience increases the effect of insecurity on the importance placed on content.

DISCUSSION

The objective of this study was to empirically investigate the relationship between customer characteristics (both demographic and psychographic) and usability requirements. We set our study in the context of website usability – more specifically, online services where purpose of use is utilitarian in nature. Utilitarian sites aim to provide instrumental value (e.g., obtaining directions, buying a product) and are generally oriented towards problem-solving. Over the last decade, the importance of these services has grown significantly across a wide spectrum of industries (e.g., banking, health, e-learning, retail, customer services, access to government services, and ticketing and reservations, etc.). Usability of the service interface is central as it drives use and retention – if a site fails to provide needed features, leaving is typically the first line of defense for customers as there are plenty of other websites available.

Usability requirements address what is important to customers with regard to the design of online interfaces. While researchers have proposed different requirements (Eighmey and McCord, 1998; Gehrke and Turban, 1999; Zhang and von Dran, 2002), in our study we considered usability using the Microsoft Usability Guidelines (MUG) (Agarwal and Venkatesh, 2002). While MUG provides a set of usability requirements and has proven to offer a useful evaluative procedure, prior research has not addressed *why* online customers would place more or less emphasis on any of the requirements. Ultimately, such an understanding may help inform the design of websites to meet customer needs. Given this gap in the literature, we drew from a growing body of research interested in understanding what individuals believe about technology and how these beliefs might influence usability requirements (Barley, 1986; DeSanctis and Poole, 1994; Massey et al., 2007; Orlikowski and Gash, 1994; Tan and Hunter, 2002). Customers' beliefs form the basis for expectations of how online interfaces should work and therefore provide a foundation for understanding why various aspects of usability may be more (or less) important. Drawing from HCI, IS, and marketing research, we argued that psychographic beliefs will influence usability requirements. Moreover, we argued that prior Web experience will play a moderating role, attenuating the effects of both positive and negative beliefs. No prior research has examined the impact of customer-specific beliefs on usability requirements (Zeithaml et al., 2002).

Overall, our results provide insight into the influence of customer characteristics on usability requirements. Contrary to past research and our hypothesis, our results indicate that the demographic characteristic of gender did not significantly influence usability requirements. While we are not suggesting that demographics are unimportant, when compared to our results concerned with beliefs, our findings lend credence to our position that psychographic

characteristics offer a worthwhile perspective and alternative. This is particularly true when demographic characteristics are not significant or when a target population is demographically homogeneous.

With regard to the positive technology beliefs, as expected, we found that optimism has a significant and positive relationship with the relative importance of perceived ease of use. Yet, we found that prior Web experience weakened this relationship. While optimistic customers generally value ease of use, it becomes seemingly less important to them as they gain experience. It may be that experience changes expectations around convenience and efficiency. For example, through experience and/or prolonged site use, the very notion of what is “easy” versus “hard” may change and/or optimistic users may come to believe that websites are generally easy to use. In contrast, we found no evidence that innovativeness was significantly related to the relative importance of usability requirements and prior Web experience played no moderating role. Overall, this suggests that one’s desire for control, flexibility, and efficiency (optimism) may be more central to usability needs than the extent to which one is at the leading edge of new technologies (innovativeness).

With regard to negative technology beliefs, our results confirm that discomfort has a significant and positive relationship with the relative importance of content. We also found that the interaction effect with prior Web experience was significant and negative. By definition, discomfort reflects a lack of control over technology. Thus, delivering the right depth and breadth of content would be more important to such customers. At the same time, our results suggest that feelings of discomfiture can be abated with experience, thus attenuating the importance these users place on content as a usability requirement. Insecurity is significantly negatively related to the relative importance of content, and prior Web experience, contrary to our expectations, increased this effect. This implies that experience does have the expected effect, that is, it does not result in insecure customers shifting attention to content benefits of site use. As expected, we also found that insecurity is significantly and positively related to the relative importance of made-for-the-medium. For online customers who distrust technology, the ability to tailor or personalize a site may not be viewed as intrusive, but rather may help alleviate the effects of this negative belief. Finally, contrary to our expectations, we found that prior Web experience strengthens the emphasis placed on made-for-the-medium for discomfort. One possible explanation is that experience reduces perceived complexity and provides a greater awareness of how personalization increases control, thus strengthening the relationship with made-for-the medium.

Our findings extend current thinking in IS regarding the role that technology beliefs play in influencing user requirements (Darke and Shanks, 1997; Orlikowski and Gash, 1994; Tan and Hunter, 2002). Our results provide some evidence that negative beliefs may play a more important role in shaping usability requirements than positive ones. Specifically, the relative importance placed on content is largely shaped by discomfort and insecurity beliefs. Similarly, the importance of made-for-the-medium is driven by insecurity and the interaction of prior Web experience with discomfort. For designers of online sites, design specifications may be incomplete or inaccurate without consideration of beliefs, particularly negative ones. Understanding how beliefs drive usability requirements can benefit the development and implementation process. While a demographic profile of a customer market may be known, the psychographic characteristics offer deeper insights about what motivates them. In turn, designers may improve usability by focusing on design aspects pertinent to a specific belief. For example, if discomfort is a key customer characteristic, designers could focus on content-related interface elements that would address concerns that sites are overwhelming (e.g., by providing appropriate depth and breath, appropriate use of varied media, etc.). Similarly, because customers can vary greatly in their beliefs, they may react very differently to communications about the online service (Ailawadi et al., 2001). Knowing needs and prior relevant experience can bring into focus which customers to target with a particular interface design and implementation plan.

Our work also complements research concerned with serving customers through online interfaces (Burke, 2002; Parasuraman and Zinkhan, 2002; Zeithaml et al., 2002). Ultimately, success comes from attracting new customers and repeat customers. Success in these endeavors requires a deep understanding of how customer behaviors are affected by perceptions of the interface. It is widely accepted that online interfaces should be designed with usability in mind. Our results provide new insights on how characteristics beyond demographics are related to usability requirements.

RESEARCH DIRECTIONS AND LIMITATIONS

In this study, we examined the relationship between customer characteristics and five main usability dimensions (i.e., content, perceived ease of use, made-for-the-medium, emotion, and promotion) found in MUG (Agarwal and Venkatesh, 2002). These dimensions can be broken into more refined subcategories. For example, subcategories of perceived ease of use could include site organization, various feedback options, and help features. Future research on these refined usability categories may offer even deeper insights regarding the relationship between psychographic beliefs and usability requirements. By lending greater attention to the micro-aspects of usability and what customers want, specific design strategies may be more successfully identified (Venkatesh and Venkataraman, 2006). The low R-squared values in the results also suggest the need for more research to help explain observed variability of requirements.

While MUG is fairly comprehensive, further research should examine the relationship between customer characteristics and design requirements using alternative conceptualizations of usability found in the HCI literature. For example, MUG does not specifically address design aspects that influence a site's security (e.g., provision of privacy policies, explicit security policies). These aspects may be particularly relevant to customers who hold negative beliefs (discomfort, insecurity) and in contexts where site provided services require customer input such as health or financial data (Pinhanez, 2007). Moreover, to test the generalizability of our results, research needs to be extended to other usability contexts. In the current study, we focused on usability requirements of utilitarian-oriented online websites. Building from prior research, alternative contexts may include hedonic sites, mobile access devices, and varied industries.

While this study focused on consequences of enabling and inhibiting psychographic beliefs, future research should investigate their unique antecedents. For example, prior research has found that two hemispheres of the cortex are differentially involved in affective processing (Davidson, 1998). Future research needs to examine both the cognitive (e.g., Todd and Benbasat, 1987) and neural (e.g., Dimoka et al., 2007) processes involved in the development of positive and negative beliefs. Furthermore, while positive and negative beliefs have antagonistic effects, they can be characterized by uncoupled activation (i.e., changes in one system are not accompanied by changes in the other), co-activation (i.e., changes in one system are accompanied by parallel changes in the other system), and co-inhibition (i.e., changes in one system are accompanied by opposite changes in the other system) (Larsen et al., 2001). While this study assumed uncoupled activation, future studies could relax this assumption and examine co-activation or co-inhibition of beliefs.

Lastly, the sample in this study provided both strengths and weaknesses. For example, nearly 95% of the participants in this study were between 18-34 years old. While our sample had little variance in age, this population is often described as a key target market for technology-based services. While we found no effects on usability requirements with regard to gender, other demographics (e.g., income level, education) may be relevant. As the population of inquiry is expanded, additional research is needed regarding the relationship between psychographic beliefs and demographics. However, the relative demographic homogeneity of our sample provides a useful setting in which to study the relevance of psychographics. Specifically, the subjects held diverse beliefs and these beliefs had differential effects on the relative importance of various usability requirements. Overall, the findings and sample highlight the importance of moving beyond demographic profiles of customers to include a view of underlying technology beliefs.

CONCLUSION

Designing websites that are responsive to customers' needs is a critical prerequisite for success of online services. Usability requires not only a perspective on design aspects, but also on customers themselves. The goal of this research was to extend recent usability research (Agarwal and Venkatesh, 2002; Massey et al., 2007; Venkatesh et al., 2003b; Venkatesh and Venkataraman, 2006) by investigating the relationship between customer characteristics and usability requirements. In addition to considering the demographic characteristic of gender, we examined the role of psychographic characteristics – specifically, the beliefs customers hold about technology. Our approach recognizes that even though customers may be similar demographically, they may not be motivated by the same beliefs and these differences are related to different usability requirements.

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APPENDIX A: PSYCHOGRAPHIC BELIEFS: MEASUREMENT ITEMS

Optimism
OPT1 Technology gives people more control over their daily lives.
OPT2 I like the idea of doing business via computers because I am not limited to regular business hours.
OPT3 Technology makes me more efficient in my occupation.
OPT4 Technology gives me more freedom of mobility.
Innovativeness
INN1 Other people come to me for advice on new technologies.
INN2 I can usually figure out new high-tech products and services without help from others.
INN3 I keep up with the latest technological developments in my areas of interest.
INN4 I enjoy the challenge of figuring out high-tech gadgets.
Insecurity
INS1 If I provide information over the Internet, I can never be sure it really gets to the right place.
INS2 I do not consider it safe giving out a credit card number over a computer.
INS3 I worry that information I send over the Internet will be seen by other people.
INS4 Any business transaction I do electronically should be confirmed later with something in writing.
Discomfort
DIS1 Technical support lines are not helpful because they don't explain things in terms I understand.
DIS2 There is no such thing as a manual for a high-tech product or service that's written in plain language.
DIS3 If I buy a high-tech product/service, I prefer to have the basic model over one with a lot of extra features.

All 5-point Likert scales (1=strongly disagree to 5=strongly agree)

APPENDIX B: USABILITY REQUIREMENTS – INSTRUCTIONS

This part of the questionnaire relates to how important you believe several attributes are in determining the usability of websites, in particular online service sites such as news, maps, restaurant guides, etc. Such sites may ask you to share information with the site to leverage the site's functionality. You have 100 points to distribute across the 5 categories below. You should distribute the points based on the relative importance of the categories in determining usability. In other words, the more important a category is to you, the more points you allocate to it. Note that you are *not* saying how good any particular site is with regard to each category, but rather how *important* each category is to you in ultimately deciding the overall usability of a website.

Category	Explanation	Weight
Content	The extent to which a website offers informational and transactional capability.	
Ease of Use	The extent to which a website is free of effort.	
Made-for-the-medium	The extent to which a website can be tailored to fit your specific needs.	
Emotion	The extent to which a website evokes emotional reactions from you.	
Promotion	The extent to which a website is promoted on the Web/Internet, other media, and/or other platforms.	
Total (Maximum: 100 Points)		100

APPENDIX C: SURE ANALYSIS – MODEL 1

	Dependent Variables				
Independent Variables	Content	EOU	MFM	Emotion	Promotion
Intercept	0.00 (6.16)	0.00 (4.80)	0.00 (3.95)	0.00 (2.82)	0.00 (3.07)
Gender	0.05 (1.79)	0.11 (1.39)	-0.11 (1.15)	-0.09 (0.82)	-0.05 (0.89)
Age	0.10 (1.47)	0.00 (1.14)	0.01 (0.94)	-0.13 (0.67)	-0.1 (0.73)
Prior Web experience (EXP)	0.17** (1.89)	-0.19*** (1.47)	-0.10 (1.21)	-0.03 (0.87)	0.12* (0.94)
R^2	0.04 F=3.14**	0.05 F=3.63**	0.02 F=1.47	0.03 F=1.88	0.03 F=2.21*

Standardized coefficients are shown, with standard errors in parentheses.
***significant at $p < 0.01$; **significant at $p < 0.05$; *significant at $p < 0.1$

APPENDIX D: SURE ANALYSIS – MODEL 2

	Dependent Variables				
Independent Variables	Content	EOU	MFM	Emotion	Promotion
Intercept	0.00 (9.65)	0.00 (7.52)	0.00 (6.20)	0.00 (4.52)	0.00 (4.88)
Gender	0.04 (1.79)	0.09 (1.40)	-0.07 (1.15)	-0.08 (0.84)	-0.05 (0.91)
Age	0.09 (1.46)	-0.01 (1.14)	0.03 (0.94)	-0.11* (0.69)	-0.11 (0.74)
Prior Web experience (EXP)	0.17** (1.98)	-0.18** (1.54)	-0.14** (1.27)	-0.04 (0.93)	0.17 (1.00)
Optimism	-0.05 (1.46)	0.11 (1.14)	-0.03 (0.94)	0.04 (0.68)	-0.08 (0.74)
Innovativeness	0.02 (1.09)	-0.15* (0.85)	0.23*** (0.70)	0.02 (0.51)	-0.11 (0.55)
Discomfort	0.22** (1.26)	-0.25*** (0.99)	0.06 (0.81)	0.02 (0.59)	-0.16 (0.64)
Insecurity	-0.23*** (1.11)	0.08 (0.86)	0.17** (0.71)	0.04 (0.52)	0.08 (0.56)
R^2	0.09 F=2.99***	0.10 F=3.21***	0.07 F=2.18**	0.03 F=0.89	0.05 F=1.64

Standardized coefficients are shown, with standard errors in parentheses.
***significant at $p < 0.01$; **significant at $p < 0.05$; *significant at $p < 0.1$

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