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Anthony O. Vance
1048 Longwood Drive
Woodstock, GA 30189

The director of this dissertation is:

Dr. Detmar Straub
Computer Information Systems
9th Floor, 35 Broad Street, Atlanta, Georgia, 30302, USA

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TRUSTING IT ARTIFACTS: HOW TRUST AFFECTS OUR USE OF TECHNOLOGY

BY

ANTHONY OSBORN VANCE

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree
of
Doctor of Philosophy
in the Robinson College of Business
of
Georgia State University

GEORGIA STATE UNIVERSITY
ROBINSON COLLEGE OF BUSINESS
2009

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ACCEPTANCE

This dissertation was prepared under the direction of the candidate's Dissertation Committee. It has been approved and accepted by all members of that committee, and it has been accepted in partial fulfillment of the requirements for the degree of Doctor in Philosophy in Business Administration in the Robinson College of Business of Georgia State University.

____
Dean: H. Fenwick Huss
Robinson College of Business

Dissertation Committee:

____
Chair: Dr. Detmar Straub

____
Dr. Arun Rai

____
Dr. A. Faye Borthick

____
Dr. Michel Kalika

____
Dr. Mikko T. Siponen

ABSTRACT

TRUSTING IT ARTIFACTS:
HOW TRUST AFFECTS OUR USE OF TECHNOLOGY

By

ANTHONY OSBORN VANCE

9/13/2008

Committee Chair:	Dr. Detmar Straub
Major Department:	Computer Information Systems

Despite recent interest in the role of trust in Information Systems, the potential of IS to foster trust in business relationships remains largely untapped. In order to better realize this potential, this dissertation examines three areas of IS trust research for which research is particularly limited: (1) the IT artifact as a target of trust, (2) IS-based source credibility as an antecedent of trust, and (3) the effect of anonymity on trust in online environments. The objective of this dissertation is to examine the effects of IS on trust in each of these areas. To do so, a multi-paper dissertation format is adopted in which each area examined constitutes a distinct, though complimentary, study. Together, these studies further research on how IS can enhance trust in business relationships.

Acknowledgements

I wish to thank:

- My wife Sarah for encouraging me throughout the dissertation process.
- My family, for their support.
- Detmar Straub, for his willingness to collaborate with me even before I asked him to serve as my adviser. Also, for ensuring that we met weekly, despite his increasingly busy schedule. He has been a wonderful adviser and friend.
- Robert Sainsbury, for collaborating with me on the data collection for the third chapter of this dissertation.
- My committee members, for their input, time, and friendship.
- Dan Robey, for advising me throughout the Ph.D. program.
- Libby Crawley, for her attentiveness and support.
- Emmanuel Monod, for facilitating my Ph.D. at the University of Paris—Dauphine, and ensuring I had a positive experience there.
- The GSU faculty and fellow Ph.D. students, who made my experience at GSU enjoyable and successful.
- Paul Lowry, for mentoring me during and after my time in the BYU Ph.D. preparation program. He has always been ready to advise and has been a good co-author and friend. Thank you for all of your service on my behalf.

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CHAPTER 1: INTRODUCTION

Introduction

In recent years, trust has become increasingly recognized for its essential role in encouraging users to adopt and use information systems (Gefen et al. 2003b; Pavlou et al. 2004a). Accordingly, a rapidly growing body of IS research is investigating the most effective means of increasing trust (Gefen et al. 2006b). To date, the majority of this research has examined the effects of trust in the context of e-commerce over the Web (McKnight et al. 2002a; McKnight et al. 2002f; Pavlou 2003b). Although trust placed in e-commerce websites is important, recent research indicates that trust may be a far more pervasive issue in the field of Information Systems than thought previously. Benbasat, Wang and others have pointed to the development of trust in online recommendation agents (Wang et al. 2005; Wang et al. 2007; Xiao et al. 2007a). Lippert has shown evidence that user trust or depend on database tools such as Microsoft Access (Lippert 2001a). Further still, McKnight has conjectured that trust is an important factor for a wide range of IT when such systems must be relied upon in contexts involving risk or uncertainty (McKnight et al. 2005). Because these findings relate to a few forms of IT and trust related constructs, further research is needed to examine the effects of trust in different forms of IT and additional theoretical variables that related to trust and IT (Gefen et al. 2006b).

This multi-paper dissertation examines trust in the following nascent areas, namely (1) trust in the IT artifact and (2) antecedents of trust in online settings. These two areas will be researched in three separate papers—Chapters 2 and 3 will examine the trust in the IT artifact and Chapter 4 will examine antecedents of trust. Chapter 5 summarizes the potential contributions and limitations for these papers. The broad theoretical issues and potential contributions will next be discussed for each of these areas of research.

Trust in IT Artifacts

Chapters 2 and 3 of this dissertation proposal examine the application of trust to IT artifacts. In the trust formation process, a trustor subconsciously looks for available cues of the trustworthiness of a trustee (Gefen et al. 2003b). Recently, researchers have shown that the trust formation process holds even when an IT artifact, rather than a business or organization, is the object of trust (Komiak et al. 2006; Lippert 2001b; Wang et al. 2005). In these studies, it was found that people do form trusting beliefs toward IT artifacts (i.e., whether or not people perceived the IT artifact to possess dependable/useful characteristics). These trusting beliefs then strongly predicted trusting intentions (i.e., whether or not people were wiling to depend on the IT artifact).

In online environments such as the Web, a range of cues are available such as privacy seals (LaRose et al. 2007), website quality (Wolfinbarger et al. 2003), or perceived size of the company (Jarvenpaa et al. 2000). For other IT artifacts, applicable trusting cues and their effects are little understood. These gaps are the basis for Chapters 2 and 3 of this proposal.

In both of these chapters an underlying theory is Fishbein and Ajzen's Theory of Reasoned Action (Fishbein et al. 1975b), which predicts that beliefs lead to attitudes, which in turn lead to intentions and ultimately behaviors. The process of progressing from beliefs to behaviors has been found to be highly amenable to the formation of trust. McKnight et al, adapting Davis' more parsimonious version of TRA (Davis 1989a), theorized that trusting beliefs, trusting intentions, and trusting behaviors describe the cognitive process whereby a truster determines whether or not to place trust in an unknown trustee (McKnight et al. 2002f). Trusting belief is the strong belief that the trustee has characteristics that would benefit the truster. These beliefs lead to trusting intention, which is the willingness or intention of the truster to rely on the trustee. Finally, trusting intention leads to trusting behavior, which is the act of the truster becoming vulnerable to the trustee in a situation of uncertainty.

By using TRA as a theoretical framework, various relevant beliefs relative to the formation of trust in an IT artifact can be examined as well as their effects on trusting intentions towards an IT artifact. Chapters 2 and 3 therefore examine IT artifacts as direct targets of trust with trust being the principal theoretical construct. The next section discusses the influence of trust on IT control in connection to other relevant constructs.

Source Credibility as an Antecedent of Trust

An area of interest among trust researchers is identifying antecedents of trust and theories that relate these antecedents to trust (Gefen et al. 2008). Chapter 4 identifies source credibility (Chaiken et al. 1994; Hovland et al. 1951-1952; Sternthal et al. 1978) as an important antecedent of trust that can explain a variety of trust building mechanisms such as privacy seals, assurance statements, and brand alliances. Previous research indicates that credibility of sources serves as an antecedent for trust, particularly in a variety an online shopping context (Doney et al. 1997; Sénécal et al. 2004). Further, Xiao and Benbasat (2007b) claim that individuals quickly form trusting beliefs in credible sources even without firsthand knowledge of these sources.

Chapter 4 uses source credibility theory to explain how trust-building mechanisms such as website quality, brand alliances, privacy seals, and assurance statements act as antecedents of trust. In addition the affect of antecedents of trust on perceived risk is also examined.

Publication Status of Dissertation Chapters

Because this dissertation follows a multi-paper model, each chapter represents individual research studies, some of which have already been published or submitted for review. Table 1 summarizes the order of coauthors and disposition of each chapter.

Table 1. Chapter Authorship and Publication Status

Chapter	Authors[*]	Status
2	Anthony Vance, Christophe Elie-dit-cosaque, Detmar Straub	Published in *Journal of Management Information Systems* as Vance et al. (2008)
3	Anthony Vance	Working paper
4	Anthony Vance, Paul Lowry, Greg Moody, Taylor Wells, Bryan Beckman	Working paper

[*] In order of authorship

Complementarily of Trust Studies

The research proposed on trust in IT artifacts in Chapters 2, 3, and 4 compliment each other in that each examines antecedents of trust and demonstrate the substantial effects of trusting beliefs on IT adoption. Until recently, trust was not thought to be a relevant concept in the of IT artifacts. Further, important antecedents of trust are still beginning to be understood. The proposed research demonstrates the substantial effect that trust can have on the adoption and use of a wide range of information systems.

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Xiao, B., and Benbasat, I. "E-Commerce Product Recommendation Agents: Use, Characteristics, and Impact," *MIS Quarterly* (31:3) 2007b, pp 137-209.

CHAPTER 2: EXAMINGING TRUST IN IT ARTIFACTS: THE EFFECTS OF SYSTEM QUALITY AND CULTURE

Anthony Vance
CIS Department
J. Mack Robinson College of Business
Georgia State University
Research Center in Management and Organization (DRM/CREPA)
Université Paris–Dauphine
Anthony@Vance.name

Christophe Elie-dit-cosaque
Research Center in Management and Organization (DRM/CREPA)
Université Paris–Dauphine
CIS Department
J. Mack Robinson College of Business
Georgia State University
celieditcosaque@gmail.com

Detmar Straub
CIS Department
J. Mack Robinson College of Business
Georgia State University
dstraub@gsu.edu

Abstract

While the topic of trust in IT artifacts has piqued interest among researchers, studies of this form of trust are not definitive regarding which factors contribute to it the most. Our study empirically tests a model of trust in IT artifacts that increases our understanding in two ways. First, it sets forth two previously unexamined system quality constructs, Navigational Structure and Visual Appeal. We found that both of these system quality constructs significantly predict the extent to which users place trust in mobile commerce technologies.

Second, our study considers the effect of culture by comparing the trust of French and American potential users in m-commerce technologies. We found that not only does culture directly impact user trust in IT artifacts, but it also moderates the extent to which Navigational Structure affects this form of trust. These findings show that system quality and culture significantly affect trust in the IT artifact and point to rich possibilities for future research in these areas.

Keywords: trust in the IT artifact, m-commerce, m-commerce portals, system quality, institution-based trust, navigational structure, visual appeal, intention to use systems, culture, and IT

Introduction

A large and growing body of research has examined the role of trust in e-commerce transactions. Much of this research has looked at the nature of consumer trust placed in institutions supporting e-commerce (Gefen et al. 2003d). Trust in suppliers and communities has also been explored (Pavlou et al. 2004a; Pavlou et al. 2005). What has been generally absent from these investigations, however, is a focus on the effects of trust placed in the IT artifacts themselves. Recent research has shown that the phenomenon of trust involves not only people (Komiak et al. 2006; Lippert 2001b; Wang et al. 2005), but also IT artifacts—hardware or software that enable tasks (Benbasat et al. 2003). Users place trust in IT artifacts by "relying or depending on infrastructure systems like the Web or relying on specific information systems like Microsoft Excel™" (McKnight 2005, p. 330). One exception to the lack of attention to the topic of trust in IT artifacts is Wang and Benbasat (Wang et al. 2005), a seminal study that found that consumers do place significant levels of trust in IT artifacts when transacting business online. Because there is very little work beyond this, Wang and Benbasat (Wang et al. 2005) call for further research to extend the conceptualization of trust in IT artifacts and identify relevant factors that contribute to their formation. This study is a response to their call.

The objective of this study is to suggest and empirically test a model of trust in IT artifacts. To do so, we examine m-commerce portals (Halvey et al. 2006), Internet-based storefronts of e-commerce sites specifically tailored for mobile devices (Ali 2007; Siau et al. 2003; Wagner 2005). We believe that it is especially instructive to examine trust in emerging IT artifacts where, from a commercial point of view, the eventual acceptance or rejection of the artifact is still very much in doubt. Such is the case for technologies relating to mobile commerce, which continue to struggle to find widespread consumer adoption (Ali 2007). Studies that explore such artifacts may help to explain how trust might affect the diffusion of new technologies.

Our model breaks new ground by incorporating system quality characteristics thought to be important in m-commerce scenarios, namely Navigational Structure and Visual Appeal (Lee et al. 2003; Sarker et al. 2003). We empirically test our model by conducting a free simulation experiment involving a simulated m-commerce portal. One contribution of this study is the finding that system quality attributes significantly influence users' trust in m-commerce portals. These findings have relevant implications for practitioners in that manufacturers such as Apple, Nokia, and Sony are currently seeking ways to dramatically improve the user interface of m-commerce devices and thus spur m-commerce activity (Ali 2007).

Our model of trust in the IT artifact also incorporates culture as an important component. Culture is an important explanatory factor in the use of information systems and the Web. It has, for example, been tied to an individual's willingness to become committed to new technologies (Straub 1994). But the effect of culture on an individual's trust in IT artifacts is still unexplored territory. Consequently, following the call from Zaheer and Zaheer (2006) for more cross-cultural, comparative research to explore in greater depth the linkages between culture and trust, we also investigate this aspect. Our model demonstrates that culture does significantly affect user willingness to trust in an IT artifact, suggesting several implications for the design mobile web interfaces and IT artifacts in general.

Literature Review, Research Model, and Hypotheses

Before reviewing the literature relevant to testing the nomology outlined above, we foreshadow our views in Figure 1, which is the full research model eventually presented for consideration. The model shows direct effects via solid lines and moderating effects as dotted lines affecting paths.

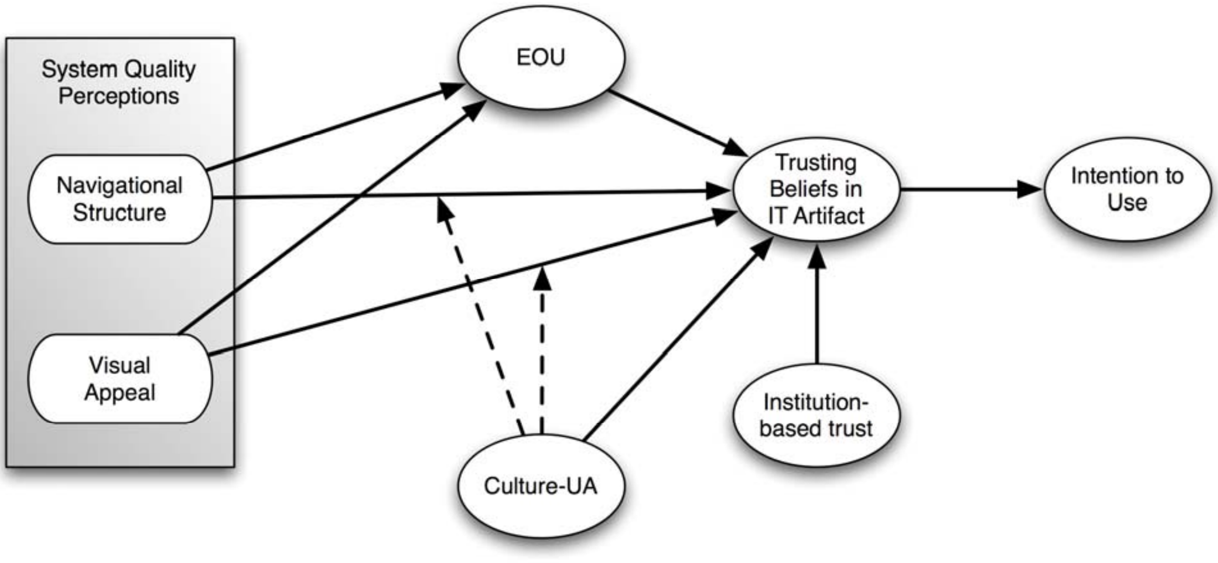
System Quality Perceptions
Navigational Structure
Visual Appeal
EOU
Trusting Beliefs in IT Artifact
Intention to Use
Institution-based trust
Culture-UA

Figure 1. Research Model for Antecedents of Trust in the IT Artifact

Trust in IT Artifacts

In recent years, trust has become increasingly recognized for its essential role in encouraging consumers to adopt online modes of commerce (Gefen et al. 2003a; Gefen et al. 2003d; McKnight et al. 2002b; Pavlou et al. 2004a). However, a persistent gap in IS trust literature is the effect of the IT artifact on consumers. Most trust-related IS literature has viewed the IT artifact simply as an enabling ingredient of online transactions, focusing instead on vendor- or institution-based effects of trust (Gefen 2000a; Gefen 2002b; McKnight et al. 2002b; Pavlou et al. 2004a). These extremely valuable insights notwithstanding, recent work has pointed to the major role that the IT artifact can itself assume in engendering consumer trust. A number of studies have investigated the ability of online software-based recommendation agents to increase consumer trust in online retail sites (Qiu et al. 2005; Wang et al. 2007), demonstrating indirectly, at least, that IT artifacts can impact consumer trust.

However, aside from trust in recommendation agents, little empirical research has examined trust in IT artifacts. One exception is the research of Lippert (Lippert 2001b) who examined trust placed in various organizational information systems and found evidence that predictability, reliability, technical utility (comprised of perceived usefulness and perceived ease of use) are each positively correlated with trust in the IT artifact. The present study aims to explore the conceptualization of trust placed in technology by examining other factors that may contribute to trust in IT artifacts and to provide empirical evidence for the relative strengths of these factors on the engendering of trust. We next formulate our model of trust in the IT artifact.

The Effect of Trust on Intention to Use

Trust researchers have found a strong relationship between trusting beliefs and trusting intentions. According to Fishbein and Ajzen's Theory of Reasoned Action (TRA) (Fishbein et al. 1975b), beliefs lead to attitudes, which in turn lead to intentions and ultimately behaviors. The process of progressing from beliefs to behaviors has been found to be highly amenable to the formation of trust. McKnight et al, adapting Davis' more parsimonious version of TRA (Davis 1989a), theorized that trusting beliefs, trusting intentions, and trusting behaviors comprise the cognitive process by which a truster determines whether or not to place trust in an unknown trustee (McKnight et al. 1998). Trusting belief is the belief that the trustee has characteristics that would benefit the truster. These beliefs lead to trusting intention, which is the willingness or intention of the truster to rely on the trustee. Finally, trusting intention leads to trusting behavior, which is the act of the truster becoming vulnerable to the trustee in a situation of uncertainty.

This cognitive process of trust formation has been shown to positively influence a person's intention to use e-commerce websites (Gefen et al. 2003a; Gefen et al. 2003d; McKnight et al. 2002b; Wu et al. 2005). Recently, researchers have shown that this trust formation process holds even when an IT artifact, rather than a business or organization, is the object of trust (Komiak et al. 2006; Lippert 2001b; Wang et al. 2005). In these studies, it was found that people do form trusting beliefs toward IT artifacts (i.e., whether or not people perceived the

IT artifact to possess dependable/useful characteristics). These trusting beliefs then strongly predicted trusting intentions (i.e., whether or not people were wiling to depend on the IT artifact). Consistent with these findings, our first hypothesis is as follows:

H_1: Trusting Beliefs in the IT Artifact will positively affect Intention to Use.

Institution-based Trust and Trust in IT Artifacts

Another important element of trust is Institution-based Trust—a person's feeling or belief that the environment in which he/she transacts has appropriate safeguards and protections (Gefen et al. 2006c; McKnight et al. 2002b). McKnight et al. define two dimensions of Institution-based Trust, namely structural assurance, the belief that "structures are in place to promote success" (McKnight et al. 2002b, p. 339), and situational normality, the belief that "the environment is in proper order and success is likely because the situation is normal and favourable" (McKnight et al. 2002b, p. 339).

McKnight et al. (McKnight et al. 1998) have theorized that Institution-based Trust significantly affects both trusting beliefs and trusting intentions. Several recent studies have found that Institution-based Trust can strongly influence trust in online environments (Ba et al. 2002; Pavlou et al. 2004a; Pavlou 2002). McKnight et al. suggest that consumers' perceptions of high situational normality contribute to trust place in online vendors (McKnight et al. 2002b). However, despite its formative role, little IS research has examined Institution-based Trust. Gefen et al. (Gefen et al. 2006c) have recently called for IS research to include Institution-based Trust in our models, specifically as it relates to the IT artifact.

Regarding its role in trust formation, theorists have explained that components of Institution-based Trust, namely structural characteristics of safety and security, are just some of many cues that people use when determining whether to place trust in another party (Gefen et al. 2003a). In online contexts where other cues are available, such as peer endorsement (Lim et al. 2006a) or recommendation agents (Komiak et al. 2006; Wang et al. 2005), Institution-based Trust may be less salient. However, in e-commerce settings where available cues are minimal and people chiefly transact with new and/or unknown entities the role of Institution-based Trust becomes much more important (Gefen et al. 2006c). In such cases, users take into account the structural characteristics and normality of the environment to counterbalance the lack of cues needed to form trusting beliefs in an online service. We therefore hypothesize that a person's perception of the Institution-based Trust in the Internet will positively affect his/her trusting beliefs in the IT artifact.

H_2: Institution-based Trust will positively affect Trusting Beliefs in the IT Artifact.

Ease of Use Linked to Trust

We further hypothesize that greater Perceived Ease of Use (EOU) will correspond to higher levels of trusting beliefs. This hypothesis is consistent with the integrated Trust-TAM model advanced by Gefen et al. (Gefen et al. 2003d), who found strong evidence that EOU leads to higher levels of trust. More recently, Wang and Benbasat (Wang et al. 2005) also found strong support for this relationship. The logic for this relationship is that in the absence of better information, people use available information such as appearance as a heuristic to judge trustworthiness (Blau 1964b). Gefen et al. (Gefen et al. 2003d) observe that PEOU should also increase trust through the perception that the e-commerce vendor is investing in the relationship, and, in so doing, signals a commitment to the business relationship. We formalize this hypothesis as**:**

H_3: Perceived Ease of Use will positively affect Trusting Beliefs in the IT Artifact.

System Quality

In order to identify relevant formative sub-constructs that map well to the construct of trust in the IT artifact (Burton-Jones et al. 2006b), this research incorporates constructs from system quality literature. System quality is a major component of the DeLone and McLean model for IS success and later respecifications (DeLone et al. 1992; Seddon 1997). However, research examining system quality and its components has been sparse over the last decade (Nelson et al. 2005). An exception is literature on website quality which has developed into an active research stream (Field et al. 2004a; Loiacono 2000). Seddon defines system quality as "whether or not there are 'bugs' in the system, the consistency of the user interface, ease of use, quality of documentation, and sometimes, quality and maintainability of the program code" (1997, p. 246).

System Quality and Trust

System quality attributes are relevant to the concept of trust because recent research suggests that technical aspects of IT artifacts do affect users' willingness to trust (Gefen et al. 2006c). For instance, McKnight et al. (McKnight et al. 2002d) found site quality to be a stronger predictor of trusting beliefs (.51) than either reputation (.39) or structural assurance of the Web (.10).

However, beyond this recognition of a link between quality and trust, prior website quality research only tacitly includes the concept of trust. In two extensive and independent literature reviews of website quality, both Field et al.(Field et al. 2004a) and Wolfinbarger and Gilly (Wolfinbarger et al. 2003) show that risk and security are major components of a plurality of website quality studies. One can argue that because security and risk are closely related to trust (Chellappa et al. 2002; Featherman et al. 2003; Pavlou 2003a; Salam et al. 2003), trust is, in fact, a tacit component of many website quality studies. This tacit accordance with trust research makes website quality especially relevant and viable for integration into conceptual trust models.

Website Quality/User Interface (UI) Measures

In their extensive review of system quality in IS research, Nelson et al. identified two IT domains requiring further investigation of relevant system quality constructs: "Web-based applications and mobile Internet services" (2005, p. 220). Accordingly, we selected two system quality constructs that should strongly relate to trust in mobile commerce technologies: Navigational Structure and Visual Appeal (Montoya-Weiss et al. 2003). Each of these attributes is highly cited in m-commerce literature and relate well to the technological qualities identified above as likely impacting trust in the IT artifact.

Navigational Structure. Navigational Structure is defined as "the organization and hierarchical layout of the content and pages in a Website" (Montoya-Weiss et al. 2003, p. 449) and involves the relative effort required for a user to traverse an IT artifact user interface (Loiacono 2000). Navigational Structure is a common component of many website quality studies (Loiacono 2000; Loiacono et al. 2002; Montoya-Weiss et al. 2003; Wolfinbarger et al. 2003).

Although Navigational Structure is related to Ease of Use, both are distinct concepts. Nelson et al. note that system quality constructs are often equated with ease of use because "ease of use may be a consequence of system quality". However, they stress that these constructs are "not the same" (2005, p. 205). In our case, while Ease of Use reflects a user's overall perception of the usability of interacting with an IT artifact, Navigational Structure is specific to how logically or intuitively information is arranged within an m-commerce site. Nelson et al. note that Navigational Structure is especially vital in mobile commerce sites because of limited screen space. In studies of m-commerce, Navigational Structure is a frequently cited by users as being crucial (Lee et al. 2003; Siau et al. 2003).

Visual Appeal. Visual Appeal is another commonly cited website quality attribute for online websites (Field et al. 2004a; Loiacono 2000; Loiacono et al. 2002; Montoya-Weiss et al. 2003; Wolfinbarger et al. 2003). Visual Appeal is defined as "the tangible aspect of the online environment that reflects the 'look and feel' or perceived attractiveness of a Website" (Montoya-Weiss et al. 2003, p. 450). Visual Appeal connotes the attractiveness of the website, including graphics, colors, and fonts (Loiacono 2000; Loiacono et al. 2002). These general aesthetics can be an important determinant of "surface credibility," the extent to which "a perceiver believes someone or something based on simple inspection" (Tseng et al. 1999, p. 42). Tseng and Fogg (1999) explain that:

> With surface credibility, people are judging a book by its cover. In the world of human relationships, we make credibility judgments of this type nearly automatically. The way people dress or the language they use immediately influences our perception of their credibility. The same holds true for computer systems and applications. For example, a Web page may appear credible just because of its visual design. (Tseng et al. 1999, p. 42).

Kim and Moon (1998) found that visual elements, such as layout and color selection, affected user's perception of the trustworthiness of the website.

Relationship between System Quality and Ease of Use

System quality and ease of use are commonly associated in IS research. In fact, Nelson et al. observe that often "ease of use may be a consequence of system quality" (2005, p. 205). Wixom and Todd (2005) also associate system quality with ease of use, albeit indirectly. In their theoretical integration of user satisfaction and technology acceptance literature, Wixom and Todd (2005) draw on attitude literature to show how users' beliefs about the quality of a system lead to attitudes of satisfaction, which in turn lead to system usage behaviors. In their model, system quality and satisfaction are object-based attitudes that "influence the beliefs a person holds or the relative importance he attaches to attitudinal and normative considerations" (Ajzen et al. 1980, p. 9). Thus, attitudes about system quality and satisfaction affect beliefs of ease of use and later intention to adopt the system.

Wixom and Todd (2005) used satisfaction as a mediating variable between the constructs of system quality and ease of use, relying on the correspondence principle (Fishbein et al. 1975b) which states that beliefs and attitudes that are nearest to the behavior of interest will be the most significant predictors of that behavior. As theorized, Wixom and Todd (2005) found satisfaction to be the most important predictor of ease of use, but they also found that system quality had a significant direct effect on EOU (path = .66, $R^2 = .55$).

Accordingly, we predict the relationship between system quality attributes of Navigational Structure and Visual Appeal and EOU as follows:

H_{4a}: Navigational Structure perceptions will positively affect Perceived Ease of Use.

H_{4b}: Visual Appeal perceptions will positively affect Perceived Ease of Use.

Relationship between System Quality and Trusting Beliefs

In addition to the mediated effect of Navigational Structure and Visual Appeal on trusting beliefs through Ease of Use, we also hypothesize that these constructs will have a direct effect on Trusting Beliefs. Several researchers have pointed to good user interface design as a means of building trust in an IT artifact (McKnight 2005). Bart et al. (2005) found that navigability and graphical presentation are important drivers for consumer trust in a website and urged managers to "go beyond privacy and security and focus on factors such as navigation and presentation" (Bart et al. 2005, p. 148). Moreover, Bart el al. (Bart et al. 2005) found that both navigation and presentation, along with other website quality measures, were more significant predictors of consumer trust in a website than privacy and security features.

Consistent with the above findings, we hypothesize that Navigational Structure and Visual Appeal will directly affect trusting beliefs in the IT artifact. During the trust formation process, people observe available cues to form trusting beliefs (Gefen et al. 2006c). In online environments such as mobile commerce where available cues are limited, system quality attributes such as visual aesthetics can strongly influence the formation of trusting beliefs, and indirectly, trusting intentions and behaviors. McKnight observes:

> Trust in technology is built the same way as trust in people. When users first experience technology, signals of well-done user interfaces and good vendor reputations will build trust. Reliable, dependable, quality IT performance is the key over time… …The entire system infrastructure should demonstrate quality (McKnight 2005, p. 330).

Accordingly, we hypothesize that Navigational Structure and Visual Appeal will influence trusting beliefs as follows:

H_{5a}: *Navigational Structure perceptions will positively affect Trusting Beliefs in the IT Artifact.*

H_{5b}: *Visual Appeal perceptions will positively affect Trusting Beliefs in the IT Artifact.*

Trust and Culture

An important gap in our understanding of trust in IT artifacts is the influence of ethnic or national culture on user willingness to trust an IT artifact. In their review of system quality literature, Nelson et al. note that "non-technical characteristics, such as task type or user demographics, may play important roles in understanding quality" (2005, p. 220). Moreover, in their extensive review of culture in IS literature, Leidner and Kayworth (2006) found that national culture significantly affects the development, implementation, adoption, usage, and management of information systems. Across these IS domains, national culture was shown to substantively influence how successfully information systems were integrated into organizations. Despite these insights, the influence of ethnic or national culture on user willingness to trust an IT artifact is not yet fully investigated. Accordingly, we investigate both culture's direct effect on trust in an IT artifact and its moderating effect on the relative salience of design attributes described previously.

Direct Effect of Culture on Trust in IT Artifacts

Culture directly affects trust in artifacts in relation to technology adoption. Trust in the IT artifact has been shown to be closely related to IT adoption (Wang et al. 2005). Additionally, much of the cross-cultural IT adoption literature involves trust (or distrust) as a point of differentiation, using Hofstede's cultural value of uncertainty avoidance, which is "the degree to which members of a society feel uncomfortable with uncertainty and ambiguity" (Hofstede 1984, p. 83). This uncertainty avoidance measure is risk-based, and has been shown to be closely related to the construct of trust (Doney et al. 1998). In Leidner and Kayworth's review (2006), 9 out of 15 studies found convincing evidence for this relationship. The reasoning for this choice is that the adoption of new IT involves risk, and, therefore, new IT should be less readily adopted in cultures with a low tolerance for risk. For example, Thatcher et al. (2003) showed how people of countries with high levels uncertainty avoidance were less willing to experiment with and adopt new technology. Srite and Karahanna (Srite et al. 2006) found that high uncertainty avoidant individuals are more influenced by their social norms to determine whether or not they should use the technology than are low uncertainty avoidance individuals. Similar effects on IS research models were found by Hasan et al. (1999), Jarvenpaa et al. (1998), Png et al. (2001), Straub et al. (1997), and Straub (1994). The literature is thus highly suggestive that individuals from uncertainty avoidant cultures will tend to place less trust in the IT artifact. We therefore posit:

> H_6: *Individuals from high uncertainty avoidance cultures will place less trust in the IT artifact than will individuals from low uncertainty avoidance cultures.*

Moderating Effect of Culture on Trust in IT Artifacts

Multiple cross-cultural studies have shown that various cultures exhibit different preferences in the design of IT artifacts. For example, Cyr et al. showed that aspects of website design such as navigability, layout, graphical elements were preferred differently across Japanese, Canadian, U.S., and German cultures (Cyr et al. 2005). Del Galdo and Nielsen (1996) and Marcus and Gould (2000) found similar results. Because culture may affect the relative importance of website design characteristics to a consumer, we expect culture to influence the extent to which system quality design elements contribute to user trust in an IT artifact. Given the effect of national culture on the preference for design elements, we offer the following *exploratory* hypotheses in relation to culture and system quality attributes of IT artifacts:

> H_{7a}: *Navigational Structure perceptions will positively affect Trusting Beliefs in the IT Artifact less for individuals from high uncertainty avoidance cultures than for individuals from low uncertainty avoidance cultures.*

> H_{7b}: *Visual Appeal perceptions will positively affect Trusting Beliefs in the*

IT Artifact less for individuals from high uncertainty avoidance cultures than for individuals from low uncertainty avoidance cultures.

Research Design

Choice of M-commerce Portals as Research Stimulus

To examine trust placed in the IT artifact, we chose m-commerce portals (viewable by the Internet- enabled mobile devices) as the IT artifact of interest. This technology is an especially good choice for issues relating to trust in IT artifacts for several reasons. To begin with, trust issues are on the forefront when users adopt new technologies (Fukuyama 1995; Gefen 1997) or participate in new modes of commerce, such as e-commerce (Gefen 2000a; Gefen et al. 2003d; McKnight et al. 2002b). Both of these points are equally true of m-commerce portals, web- or client-server-based storefronts designed to make e-commerce services accessible for mobile devices (Halvey et al. 2006; Siau et al. 2003; Wagner 2005). Just as e-commerce has made trust issues in IS especially prominent in recent years (Gefen et al. 2006c), so too we expect m-commerce to raise the awareness of trust issues as consumers begin to purchase through the unfamiliar method of using an m-commerce phone, PDA, or other enhanced mobile device and as consumers are persuaded to rely on the relatively new technology of m-commerce (McKnight 2005). This point has been made especially poignant with the introduction of Apple's iPhone™. Thus, by selecting m-commerce portals, we expect trust related issues to be more salient than might otherwise be the case with other IT artifacts.

Second, because of the small form-factor of m-commerce devices, screen space is much more limited vis-à-vis a computer workstation. This presents fewer surrogate cues to the user for human interaction as, conversely, would be available with full-scale PC-sized images, multimedia, or recommendation agents. In the absence of such human-centric trust attributes as integrity, benevolence, and trust (Wang et al. 2005), users are forced to form trusting beliefs based on attributes of the m-commerce portal itself (Lippert 2001b; McKnight

2005). Thus, we expect the use of m-commerce portals to show stronger relationships between system quality attributes and the formation of trust in the IT artifact.

Third, because m-commerce is rapidly gaining importance in many areas of the world (Sadeh 2002), it is advantageous to recognize and understand how trust issues are applicable to m-commerce portals. Finally, to our knowledge, no study has attempted to examine trust issues specific to m-commerce. Therefore, an understanding of how trust in m-commerce portals can be increased both fills an important gap in our literature and provides practitioners valuable information for the design of m-commerce portals.

Two Disparate Cultures Relative to Trust: US and France

To see how culture may have a particular bearing on trust in IT artifacts, our study was conducted in research sites in the US and France. These countries were selected because of the large difference between the U.S. and France in trusting beliefs. As profitably applied to information systems research (Gefen 1997), Fukuyama (Fukuyama 1995) presents historical analysis that France is a low-trust society while the U.S. is a high-trust society (Gefen et al. 2005a). Hofstede's findings (Hofstede 1980) likewise show a gap between France and the US on uncertainty avoidance (France, 86; U.S., 46), which is an indicator of a society's tolerance for risk (Doney et al. 1998).

The more recent cross-cultural GLOBE study by House et al. (House et al. 2004) found a similar difference in uncertainty avoidance. In their analysis of 17,300 managers in 62 cultures, House et al. (2004) examined uncertainty avoidance in terms of both cultural practices and cultural values. France was found to exhibit higher uncertainty avoidance in terms of both cultural practices (France, 4.43; U.S. 4.15) and cultural values (France, 4.26; U.S. 4.00). Inferring from this data, a likely difference in trust between France and the U.S. might be smaller than in Hofstede’s study, but the difference would still be significant in that France exhibits higher uncertainty avoidance than does the U.S. Given the agreement among these cultural analyses in the likely gap in trusting values between France and the US, we chose these two research sites to embody these differences in cultural values for trust.

Instrumentation, Experimental Procedures, and Sampling

Experimental treatments were administered in France and the US to provide a contrast between cultures. Each subject was given a pretest based on McKnight et al.'s trust measures (McKnight et al. 2002b) to gauge the participant's attitudes towards Institution-based trust, both in general and specifically in relation to online commerce. Next, a free simulation experiment was administered depicting the use of an Internet-enabled mobile phone to perform a mobile commerce transaction. The free simulation consisted of a series of mobile phone screenshots showing each step in the purchase process of an actual mobile commerce website (see Figure 2). Finally, a posttest (consisting of measures from McKnight et al. (McKnight et al. 2002b), Wang and Benbasat (Wang et al. 2005), and Montoya-Weiss et al. (Montoya-Weiss et al. 2003) was used to measure system quality attributes of the user interface, the level of trust that each participant placed in the simulated IT artifact, and user intentions to adopt the m-commerce portal as a means of purchasing.

To test the hypotheses, a free simulation experimental design was implemented, as noted above (Fromkin et al. 1976b; Gefen et al. 2003f). In free simulation experiments, treatment levels are not predetermined. Rather, levels range freely in accordance with how participants interact naturally with the simulation. The simulation consisted of a set of twelve sequential screenshots that depicted each step of the purchase process for an m-commerce portal using a cellular phone. Amazon.com's "Amazon Anywhere" service[1] was chosen as the m-commerce portal because of its high brand profile both in the United States and in Europe. Furthermore, the use of an operational m-commerce portal contributed to the realism of the simulation. Choosing a high profile brand helped to ensure that participants from both countries recognized the m-commerce seller. This better allowed us to look for differences in the perceptions of French and US subjects in similar settings.

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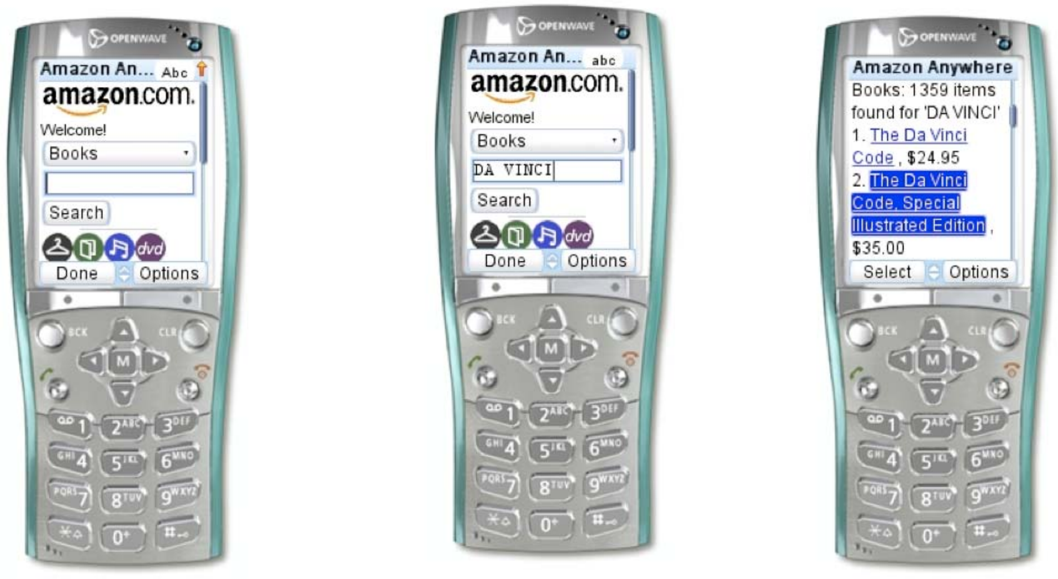
[1] Accessible at http://www.amazon.com/mcommerce (best viewed by a mobile web browser; under development 8/4/2007)


OPENWAVE
Amazon An... Abc
amazon.com.
Welcome!
Books
Search
dvd
Done
Options
OPENWAVE
Amazon An... abc
amazon.com.
Welcome!
Books
Search
dvd
Done
Options
OPENWAVE
Amazon Anywhere
Select
Options
BCK
CLR
M

DA VINCI

Books: 1359 items found for 'DA VINCI'
1. The Da Vinci Code, $24.95
2. The Da Vinci Code, Special Illustrated Edition, $35.00

Figure 2. Screenshots of Amazon Anywhere™, M-Commerce Site

After completing the pretest, participants viewed a numbered sequence of screenshots showing each step of the Amazon Anywhere m-commerce portal purchase process (see Figure 2). The Amazon Anywhere portal is an m-commerce storefront for Amazon.com's retail offerings. Specifically designed for viewing using a small screen, the Amazon Anywhere portal interface provides links to Amazon's most popular product categories as well as a simple search. The interface is designed so that it is easily navigable using the keypad of a mobile device.

In the simulated purchase process, participants viewed the steps required to search for a particular book and then select an item based on the search results. Search results displayed thumbnail images for each matching items, along with a link to more information. Once a book is selected, Amazon Anywhere provides a streamlined purchase process in which a user logs into an existing Amazon account and then pays using a pre-selected payment method. Shipping details are similarly specified beforehand. Thus, the Amazon Anywhere portal offers a streamlined storefront to Amazon.com specifically suited for browsing and purchasing on a mobile device. The entire purchasing process from start to finish was captured in a series of screenshots and reproduced in color copies[2].

Because each participant had his/her own set of screenshots, participants viewed the screenshots independently from other participants. In addition, participants were not restricted from reviewing previously examined screenshots. This lack of procedural controls is consistent with the design of a free simulation experiment, which allows participants to interact with the simulation in an unrestricted manner.

Once they had viewed the screenshots, participants took a posttest based on measures used by Wang and Benbasat (Wang et al. 2005). This posttest, itself based on the measures of McKnight et al. (McKnight et al. 2002b), was specifically designed to gauge participant levels of trust in an IT artifact. However, because Wang and Benbasat (2005) were measuring a different form of IT artifact (viz., Web-based recommendation agents), minor changes were made to adapt the posttest measures to m-commerce portals. The posttest also included system quality measures from Montoya-Weiss et al. (2003) for Navigational Structure and Visual Appeal. Attached to the posttest was a short demographical questionnaire to allow for the comparison of control data between research sites.

Participant Recruitment

The experiments were conducted at two major universities—one in a large urban setting in the southeastern United States and the other in Paris, France. Participants were recruited from MBA and other graduate-level business courses at both research sites. One of the researchers visited student courses to administer the experiment. A total of 116 participants took part in the study in France, another136 participants took part in the US.

Participants were not offered rewards for taking part in the study; however, nearly all students in the classes visited chose to volunteer and participate rather than take a break or complete an alternative activity. While offering extrinsic rewards is common in business research, several researchers suggest that incentives are negatively related to the intrinsic interest and motivation of students (Kohn 1993; Kohn 1996). While there is no consensus on this point, we believe that offering alternative activities helped to ensure that only motivated students took part in the study.

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[2] For the complete set of screenshots used in the experimental simulation, see Appendix F available at http://anthonyvance.com/appendices/Trust-JMIS-2007.pdf

Data Analysis

For data analysis, we used SmartPLS 2.0 (Ringle et al. 2005). SmartPLS is a component-based path modeling software application based on the Partial Least Squares (PSL) method. SmartPLS is comparable to PLS-Graph, since it is based on the same method and offers similar features with an improved graphical interface. While covariance based software such as LISREL is mainly designed to perform analyses involving reflective constructs, PLS-based applications such as SmartPLS or PLS-Graph can readily handle both reflective and formative constructs (Gefen et al. 2000c). Therefore, we felt SmartPLS was appropriate in that the model includes both reflective and formative constructs. Marcoulides and Saunders (2006) critique studies that use PLS with insufficient sample sizes and so we were cognizant of the need for sufficiently large groups of subjects.

Measurement Validation

The first stage in data analysis should evaluate the measurement properties of the instrumentation. Typical analyses include reliability and convergent/discriminant validity. Given the presence of both formative and reflective constructs in our model, we implemented measures consistent with the nature of the constructs. Analyses suitable for reflective constructs do not apply to formative ones (Boudreau et al. 2001b; Gefen et al. 2000c; Straub 1989). While validation of reflective constructs is well documented in the literature (Petter et al. 2007a), there is still little guidance for validating formative constructs. We therefore relied upon prior studies that used formative constructs and still assessed the measurement properties. Table 1 shows details of constructs and measures subjected to instrument validation. Table 2 details the individual measurement items of the instrument.

Table 1. Measurement of Constructs

Latent construct	Latent construct type	Subconstruct	Subconstruct type	Number of items	Authors
Institution based trust	Formative	Situational normality-general	Reflective	2	McKnight et al. (2002a)
		Situational normality-benevolence	Reflective	3	
		Situational normality-Integrity	Reflective	3	
		Situational normality-Competence	Reflective	3	
		Structural assurance	Reflective	4	
Trust in the IT artifact	Formative	Trusting-Competence	Reflective	4	McKnight et al. (2002a)
		Trust-Benevolence	Reflective	3	Wang and Benbasat (2005b)
		Trust-Integrity	-	1	
Perceived Ease of Use	Reflective	Ease of Use Perceptions	Reflective	3	Wang and Benbasat (2005)
Intention to use	Reflective	Intention to adopt	Reflective	3	Wang and Benbasat (2005b)
Visual Appeal	Reflective	Visual Appeal perceptions	Reflective	3	Montoya-Weiss et al. (2003)
Navigational Structure	Reflective	Navigational Structure perceptions	Reflective	3	Montoya-Weiss et al. (2003)

Table 2: Survey Instrument Items

Construct	Subconstruct	Code	Items	Author
			Scale : 1- Strongly disagree … 7- Strongly agree	
Institution-based trust	Situational normality-general (IG)	INSGEN1	I feel good about how things go when I do purchasing or other activities on the Internet.	McKnight et al. 2002
		INSGEN2	I am comfortable making purchases on the Internet.	
	Situational normality-benevolence (IB)	INSBEN1	I feel that most Internet vendors would act in a customers' best interest.	
		INSBEN2	If a customer required help, most Internet vendors would do their best to help.	
		INSBEN3	Most Internet vendors are interested in customer well-being, not just their own well-being.	
	Situational normality-Integrity (II	INSINT1	I am comfortable relying on Internet vendors to meet their obligations.	
		INSINT2	I feel fine doing business on the Internet since Internet vendors generally fulfill their agreements.	
		INSINT3	I always feel confident that I can rely on Internet vendors to do their part when I interact with them.	
	Situational normality-Competence (IC)	INSAB1	In general, most Internet vendors are competent at serving their customers.	
		INSAB2	Most Internet vendors do a capable job at meeting customer needs.	
		INSAB3	I feel that most Internet vendors are good at what they do.	
	Structural assurance (ISA)	INSST1	The Internet has enough safeguards to make me feel comfortable using it to transact personal business.	
		INSST2	I feel assured that legal and technological structures adequately protect me from problems on the Internet.	
		INSST3	I feel confident that encryption and other technological advances on the Internet make it safe for me to do business there.	
		INSST4	In general, the Internet is now a robust and safe environment in which to transact business.	
Trusting Beliefs in the IT artifact	Trusting Beliefs—Competence	AB1	This mobile website is competent and effective in facilitating browsing.	McKnight et al. 2002
		AB2	This mobile website is competent and effective in facilitating purchasing.	
		AB3	This mobile website performs its role of facilitating mobile commerce very well.	
		AB4	Overall, this mobile website is a capable and proficient mobile commerce facilitator.	
	Trusting Beliefs—Benevolence	BEN1	This mobile website puts my interests first.	Wang and Benbasat (2005b)
		BEN2	This mobile website keeps my interests in mind.	
		BEN3	This mobile website wants to understand my needs and preferences.	
	Trusting Beliefs—Integrity	INT1	This mobile website provides unbiased product recommendations.	
Perceived Ease of Use	Ease of Use Perceptions	PEOU1	My interaction with the mobile web site is clear and understandable.	Wang and Benbasat (2005b)
		PEOU3	Learning to use the mobile web site was easy.	
		PEOU5	Overall, I found that the mobile web site is easy to use.	
Intention to Use	Intention to adopt	INTENT1	I am willing to use this mobile website as an aid to help with my decisions about which product to buy.	Wang and Benbasat (2005b)
		INTENT2	I am willing to let this mobile website assist me in deciding which product to buy.	
		INTENT3	I am willing to use this mobile website as a tool that suggests to me a number of products from which I can choose.	
Visual Appeal	Visual Appeal perceptions	WEBGRA1	I like the look and feel of the mobile website.	Montoya-weiss et al. (2003)
		WEBGRA2	The mobile website is attractive	
		WEBGRA3	I like the graphics on the mobile website	
Navigational Structure	Navigational Structure perceptions	WEBNAV1	It is easy to find what I am looking for on the mobile website.	Montoya-weiss et al. (2003)
		WEBNAV2	It is easy to move around online using the mobile website.	
		WEBNAV3	The mobile website offers a logical layout that is easy to follow.	

Validation of Reflective Constructs and Subconstructs

Consistent with Wang and Benbasat (2005) we modeled trust as a second order construct. Our conceptualization of trust follows McKnight et al. (McKnight et al. 2002d) and so includes three sub-dimensions: competence, benevolence and integrity. Following the guidelines provided by Jarvis et al. (Jarvis et al. 2003), we modeled trust as a second-order formative construct. Indeed, we believe trust is better defined as a formative construct than a reflective one. While Wang and Benbasat seem to acknowledge the formative nature of trust (Wang et al. 2005), they decided to model it as a second-order reflective construct because measures were found to correlate highly together (McKnight et al. 2002d). Furthermore, they found no significant differences in path coefficient significance depending on the choice of modeling the trust construct as formative or reflective.

However, since modeling formative constructs as reflective ones can lead to specification errors and heightened levels of Type I and II errors (Petter et al. 2007a), we decided to model trust as a second order formative construct. Similarly, as shown in Table 1, we modeled Institution-based Trust as a second-order formative construct. We used pre-existing measures with a 7-point Likert scale, ranging from “strongly disagree to “strongly agree” (please refer to the appendices 2A and 2B for instrumentation details). We first analyzed measurement properties of the reflective construct and subconstructs of the instrument. Then, we replaced first-order reflective constructs with their latent variable scores given in SmartPLS as suggested by Wang and Benbasat (Wang et al. 2005). This allowed us to test for the validity of second-order formative constructs and the analysis of the structural paths. Internal consistency of sub-constructs was assessed via Cronbach alphas. These were calculated for both the U.S. and French samples, as well as for the overall sample. Most values were above 0.80, and all were greater than the accepted threshold of 0.70 recommended in the literature (Nunnally 1967). Overall, these results indicate acceptable measurement properties for all reflective constructs.

Discriminant validity can be assessed when items of one particular construct correlate poorly with items of all other constructs while correlating highly with their own construct. In order to assess discriminant validity of reflective constructs and subconstructs, we examined factor and cross loadings, and the average variance extracted (AVE) matrix. The factor structure[3] shows that the items load higher on their intended construct than on any other construct. Moreover, they load together with very high values. While some items also load reasonably high on unintended constructs, most of these values are below the 0.60 recommended cutoff (Fornell et al. 1981a). Therefore we can conclude that the reflective constructs differ.

Internal consistency was assessed by composite reliability and Cronbach alphas[4]. With values ranging from 0.80 to 0.95 for composite reliability and from 0.77 to 0.90 for all Cronbach alphas but one (at 0.63 for Institution-based Trust - Benevolence), we can conclude that the scales are reliable.

Validation of Formative Constructs

This study had two formative constructs. These constructs are Institution-based Trust and Trust in the IT Artifact. Because of the nature of formative constructs, different analyses need to be conducted for testing reliability and validity. In order to assess convergent and discriminant validity for these constructs, we employed the modified MTMM technique described by Loch et al.(Loch et al. 2003a).[5] Suffice it to say that the tests followed the recommended procedures in Loch et al. (2003a) and examination of the modified MTMM indicates that the instrument has acceptable measurement properties. Both convergent and discriminant validity were demonstrated in our analyses.

Common Methods Variance (CMV)

To test for common methods variance, we first conducted Harman’s single factor test (Podsakoff et al. 2003a). Podsakoff et al. (2003a) argue that if there is a detrimental level of common method bias, “(a) a single factor will emerge from exploratory factor analysis

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[3] Reported in Table B3 of the appendices available at http://anthonyvance.com/appendices/Trust-JMIS-2007.pdf

[4] Please refer to Table B4 of the appendices at http://anthonyvance.com/appendices/Trust-JMIS-2007.pdf

[5] Detailed discussion of these tests may be found in Appendix A available at http://anthonyvance.com/appendices/Trust-JMIS-2007.pdf

(unrotated) or (b) one general factor will account for the majority of the covariance among the measures" (p. 889). Since more than one factor emerged to explain the variance in our analysis, we infer that common methods bias in this case is not high. The second test was to examine a control for the effects of an unmeasured latent methods factor (Podsakoff et al. 2003, p. 891). In this analysis, of the 23 paths from CMV to single indicator constructs, only 7 were significant, indicating a relatively small amount of common methods variance[6].

Hypothesis Testing

After assessing measurement properties and CMV of the instrument, we tested our hypotheses through the PLS structural model. The sample consisted of 136 US and 116 French business students. In order to analyze the influence of culture, we coded culture as a binary variable with the value of 0 for the American subsample, and 1 for the French subsample. As suggested above, subjects from the French subsample are considered to be more uncertainty avoidant than subjects of the US subsample. Such an analysis could be criticized for not directly measuring the levels of uncertainty avoidance. However, we relied on previous work that indicates that Hofstede's detected differences still exist between France and the USA, although possibly at a lower level (Huff et al. 2003; Keil et al. 2000; Straub et al. 1997). We measured culture in our study in a way consistent with many other studies involving the effects of culture, which are largely based on Hofstede, and that consider culture at the nation-state level (Leidner et al. 2006; Srite et al. 2006; Straub et al. 2002). Other competing conceptualizations suggest a value-based approach of culture at an individual level (Srite et al. 2006). Another conceptualization is that of Leidner and Kayworth (2006) who develop a model integrating values, IT, and conflict and offer an approach for dealing with both national and organizational culture.

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[6] Both tests are described in greater detail in Appendix D available at http://anthonyvance.com/appendices/Trust-JMIS-2007.pdf

The average age in the US sample was 31.6 while it was 22.8 in the French sample[7]. Also, the American subjects spent an average of 6.3 years in college studies as compared to 4.4 years for the French subjects. In order to control those parameters, we first included them as control variables in the analysis. Since we found no significant effect of age or of time spent in college studies on the model, we later dropped them for the analyses of hypotheses. Regarding the nationality of participants, subjects in the French university were mostly French citizens, and subjects in the US university were mostly American citizens, thus implying some homogeneity in our sample at the national-culture level.

Evaluating Moderating Effects

Testing moderating effects involves comparing a "main effect" model and a moderating effect model (Carte et al. 2003; Chin et al. 2003b) and meeting nine conditions that indicate that no errors of commission have been made. Our detailed analysis concludes that we have no errors of commission[8]. The interaction terms were calculated by multiplying the moderator (Culture) by the predictor variables (Navigational Structure and Visual Appeal). The moderating effects model included these interaction variables, while the main effects model did not. However, since the moderating effect of Culture on the influence of Visual Appeal on Trusting Beliefs in the IT Artifact (TRUST) was insignificant, we decided to test only for the effect of the interaction of Navigational Structure with Culture. The R^2 of TRUST for the main effect model was $R^2=0.471$. When including the interaction term, the R^2 for TRUST is 0.488. We then calculated the effect size applying the following formula suggested by Cohen (Cohen 1988b), as in Chin et al. (Chin et al. 2003b): $F2 = [R^2 \text{ (interaction model)} – R^2 \text{ (main effect model)}]/[1-R^2 \text{ (main effect model)}]$. We thus obtained an effect size (F^2) of 0.03. Then, we multiplied F^2 by (n - k - 1) where *n* equals sample size

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[7] A summary of sample characteristics is provided in Appendix B available at http://anthonyvance.com/appendices/Trust-JMIS-2007.pdf.

[8] For more information, please see Appendix C at http://anthonyvance.com/appendices/Trust-JMIS-2007.pdf

(251) and *k* equals the number of independent variables (4). This enabled us to conduct a pseudo F-test for the change in the R^2 with 1 and n - k degrees of freedom, similarly to Mathieson et al. (Mathieson et al. 2001). The result of the pseudo F-test was 7.90 ($p < .005$). An effect size of .02 is small, .15 is moderate, and .35 is large (Cohen 1988b). Therefore we can conclude that the effect size for culture in our model is small (0.03) yet significant.

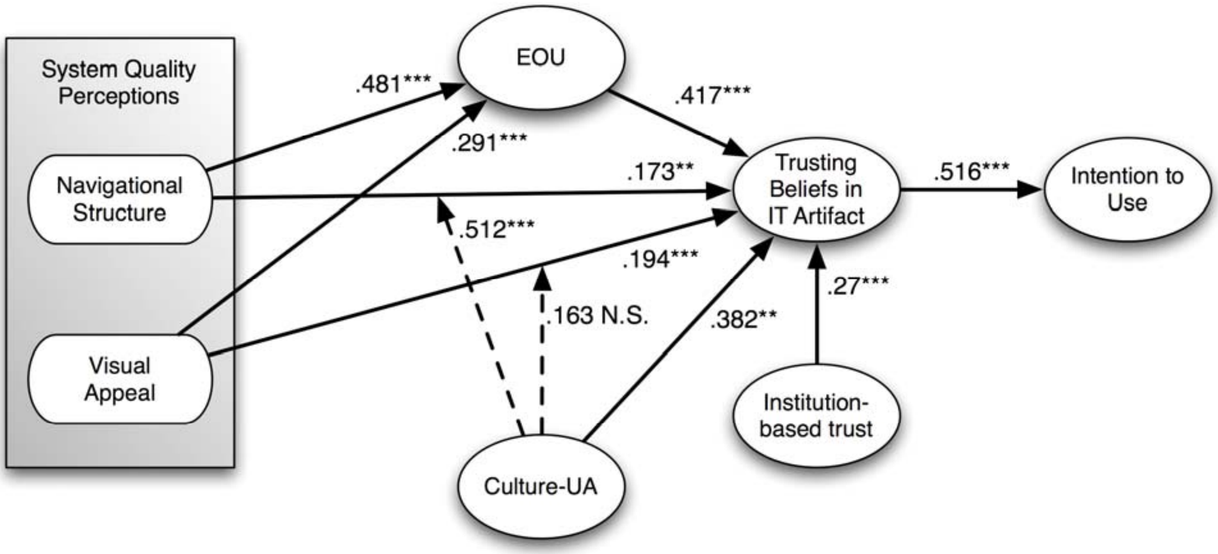
System Quality Perceptions
Navigational Structure
Visual Appeal
EOU
.481***
.291***
.417***
.173**
.512***
.194***
.163 N.S.
.382**
Trusting Beliefs in IT Artifact
.516***
Intention to Use
.27***
Institution-based trust
Culture-UA

Figure 3. Research Model Showing the Significance of Relationships
(**p<0.01; ***p<0.005)

Positing that Institution-based Trust will positively affect trust in the IT artifact, H_1 was supported. H_{4a} hypothesizing that Navigational Structure positively influences perceived ease of use is strongly supported (β=0.37, p<0.05). Similarly, H_{4b}, which states that Visual Appeal positively affects perceived ease of use, is also well supported (β=0.37, p<0.05). Our study therefore provides support for the influence of system quality on perceived ease of use. H_{5a} positing that Navigational Structure positively influences trust is supported (β=0.29, p<0.05), and H_{5b} proposing that Visual Appeal positively influences trust is also supported (β=0.21, p<0.05). H_3, which states that perceived ease of use is positively related with trust, is likewise strongly supported (β=0.33, p<0.005), as shown in prior studies (Gefen et al. 2003d; Wang et al. 2005). Consistent with prior studies (Chin et al. 2003b), H_1, which states that trust will positively affect intended use, was also strongly supported (β=0.49, p<0.005).

Table 3. Results of Hypotheses Tests

#	Hypothesis	Supported?
H_1	Trusting Beliefs in the IT Artifact will positively affect Intention to Use.	Yes
H_2	Institution-based Trust will positively affect Trusting Beliefs in the IT Artifact.	Yes
H_3	Perceived Ease of Use will positively affect Trusting Beliefs in the IT Artifact.	Yes
H_{4a}	Navigational Structure perceptions will positively affect Perceived Ease of Use.	Yes
H_{4b}	Visual Appeal perceptions will positively affect Perceived Ease of Use.	Yes
H_{5a}	Navigational Structure perceptions will positively affect Trusting Beliefs in the IT Artifact.	Yes
H_{5b}	Visual Appeal perceptions will positively affect Trusting Beliefs in the IT Artifact.	Yes
H_6	Individuals from high uncertainty avoidance cultures will place less trust in the IT artifact than will individuals from low uncertainty avoidance cultures.	Yes
H_{7a}	Navigational Structure perceptions will positively affect Trusting Beliefs in the IT Artifact less for individuals from high uncertainty avoidance cultures than for individuals from low uncertainty avoidance cultures.	Yes
H_{7b}	Visual Appeal perceptions will positively affect Trusting Beliefs in the IT Artifact less for individuals from high uncertainty avoidance cultures than for individuals from low uncertainty avoidance cultures.	No

Regarding the influence of culture in our model, two of our hypotheses were validated. H_6, that argues that culture influences trust, is supported (β=0.47, p<0.05). As posited, French people who have long been said to be more uncertainty avoidant than American people did have less propensity to trust in the IT artifact. Stating that culture has a moderating effect on the relation between Navigational Structure and trust, H_{7a} was supported (β=-0.61, p<0.05) while H_{7b}, stating the moderating effect of culture on the relation between Visual Appeal and trust, was not.

Explained variance in our model was substantial with 49.2% of the variance in IT trust explained by antecedents and 24.4% of intention to use explained by Trust in the IT Artifact.

Discussion

The results of our analysis confirm that the extent to which trust (or lack of trust) in the IT artifact manifests itself will likely affect users' intention to adopt the IT artifact. This result lends further support to prior literature that came to similar conclusions (Wang et al. 2005, p. 90). However, beyond confirming prior research results in this nascent research area, this study elucidates several possible relevant antecedents to the conceptualization of trust in the IT artifact. Our results demonstrate that trust in the IT artifact is directly influenced by system quality characteristics, viz., Navigational Structure and Visual Appeal. This is an important conclusion because it identifies aspects of trust in the IT artifact that are unique and different from attributes related to trust in people. Thus, this research addresses the call for research in Wang and Benbasat to “examine whether the conceptualization of trust in IT artifacts should be extended to include other relevant beliefs” (Wang et al. 2005, p. 90). Using these findings, researchers of trust in IT artifacts should be better able to conceptualize and model trust in IT artifacts. These results demonstrate to designers of IT artifacts that user trust placed in IT artifacts can be enhanced by giving proper consideration to design elements such as navigability and visual aesthetics.

A related contribution of our study is the theoretical linkage between trust in IT artifacts and system quality streams of research. This research has highlighted several areas of overlap between both streams of research and offers empirical evidence that significant overlap between the two research streams may exist. Other system quality measures may likely be related to trust in the IT artifact. By leveraging system quality research already performed in marketing and IS, researchers of trust in IT artifacts may be able to advance knowledge in this domain much more rapidly than if research in trust in IT artifacts was performed in isolation.

Our results also show that culture can affect the degree to which users place trust in the IT artifact. The posited contrast between the low-trust French culture and the higher-trust US culture proved out in our findings. This has important implications for researchers of trust in IT artifacts because it demonstrates that IT artifacts are not culturally neutral. Rather, individuals of different cultures may exhibit markedly different attitudes towards placing trust in an IT artifact, which may, in turn, translate into varying levels of intention to adopt the IT artifact. Therefore, researchers of trust in IT artifacts should be mindful of possible cultural interactions in their research, even if culture is not explicitly included in the research model. Furthermore, designers of IT artifacts may be advised to consider which cultures are most likely to use IT artifacts and make appropriate design decisions accordingly. Such an approach may engender trust in IT artifacts and lead to greater adoption of technologies involved.

Finally, our research contributes to research in m-commerce because it demonstrates to researchers and practitioners alike that adoption of m-commerce can be increased by improving design aspects of m-commerce portals. Even simple details such as navigational structure, layout, and graphical elements, if properly designed, can enhance user trust in m-commerce portals and lead to greater adoption of m-commerce in general. Further, our research provides evidence that the acceptance of m-commerce portals has a cultural dimension that should not be ignored. Managers who intend to deploy m-commerce devices in low-trust cultures may therefore consider taking extra measures to ensure that m-commerce portals are best designed to engender trust in the context of that culture. The several important contributions of the current study are presented in Table 4.

Table 4: Research Contributions

Element of Research	Contributions
Trust in the IT artifact	Adds to the presently sparse body of work that focuses on this important perspective on trust in systems.
System Quality	Enhances the standard model of trust leading to intention-to-use-systems by exploring the effect of two key dimensions of system quality on trust in the IT artifact; these dimensions are: Navigational Structure and Visual Appeal.
Perceived Ease of Use	Shows that Perceived Ease of Use partially mediates the effect of system quality constructs on trust in the IT artifact.
Culture	Considers the impact of low trust versus high trust cultural values and predisposition to trust on trust in the IT artifact.
Moderating Effects	Examines the possible interaction or multiplying effects of culture on elements of system quality and the graphical user interface.
Emerging Technology	Embeds the study in m-commerce, specifically the "smart" phone, a new technology that utilizes a Web-based interface.

Limitations and Future Research

Several limitations of this study should be recognized. First, the use of the Amazon.com brand in the experiment may have increased reported levels of trust due to its high brand familiarity (Bart et al. 2005). Thus, levels of trust placed in the m-commerce portal, as well as the strength of the relationships between variables in the model might thus have been affected by Amazons' brand appeal. A comparative unknown brand treatment would have allowed us to control for the effect of brand appeal. However, we would argue that it is unlikely that either the directionality of those relationships or their significance were affected by this potential bias, and thus the added realism gained from using an operational m-commerce portal was a reasonable tradeoff.

Second, subjects interacted with color screenshots rather than with actual mobile devices, thus weakening external validity. In this case, we believe the screenshots were appropriate surrogates of real devices given that our system quality constructs of interest—Navigational Structure and Visual Appeal—are both visual in nature. Additionally, the use of screenshots depicting the flow of the m-commerce transaction helped to provide a uniform experience, lessening variance due to participants' varying competence with m-commerce portals and mobile devices in general.

Third, because our study used graduate business students as participants in the experiments, the results of this study might be thought to be less generalizable to other populations (Gordon et al. 1986b). Whereas graduate students might be seen as the very consumers of both m-commerce technologies and of books we were seeking, there is a good argument that graduate business students are representative of those people who are most likely to adopt m-commerce relatively early. Nevertheless, we must acknowledge the possibility of this limitation to external validity and urge future research to consider other sites for gathering data, sites such as shopping malls.

Fourth, there is a possibility of common methods bias in that subjects were polled using the same instrumentation as to their trusting beliefs and their intentions to use the technology. We tested for this effect and did not find it to be present, but common methods bias is always a potential problem. Stronger designs would gather the dependent variable several weeks after the stimulation, a condition that we were not able to implement in this study. Many trust studies share this same limitation, however, and so there is some small measure of defense in having this weakness in common with the bulk of the trust literature.

Last, we investigated culture via France and US, which the literature indicates are low-trust and high-trust cultures respectively. We know that direct measures of cultural values are highly desirable and future research in this domain should consider measuring culture directly (Srite et al. 2006). Whereas we did find significant differences in attitudes towards Institution-based Trust between the French and US subjects, a more determined attempt to show ecological validity would employ direct measures of culture.

Conclusion

The objective of this study was to formulate and empirically test a model of trust in the IT artifact, directly applicable to m-commerce devices. This model includes system quality constructs of Navigational Structure and Visual Appeal, Ease of Use, and Culture. Each of these constructs has been identified as relevant to m-commerce portals. Our findings show that all of these constructs are significant antecedents to trust in IT artifacts. Together, our results indicate that the influence of the IT artifact on users' trusting beliefs are substantial. As such, the characteristics and design of the IT artifact should not be overlooked in studies of trust, especially those involving new technologies.

Acknowledgements

The authors wish to thank senior editor Izak Benbasat and three anonymous reviewers for their insightful comments throughout the review process. Special thanks also to Emmanuel Monod, Jessie Pallud, and Hirotoshi Takeda for their valuable assistance with data collection in France.

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CHAPTER 3: THE EFFECT OF TRUST ON USER ADOPTION OF ANONYMIZING SYSTEMS

Anthony Vance
CIS Department
J. Mack Robinson College of Business
Georgia State University
Research Center in Management and Organization (DRM/CREPA)
Université Paris–Dauphine
Anthony@Vance.name

Abstract

In order to mitigate risks inherent in sharing sensitive information, recent research has examined anonymizing systems that hide the identities of participants and decouples data from their originators. Although such systems are promising, little is known about how users learn to trust and rely on the anonymity provided by such systems.

This proposal presents a theoretical model intended to explain the trust process involved in user adoption of anonymizing systems. It is theorized that users' trusting beliefs in the information provided by the system as well as beliefs in the anonymizing capability of the system will lead to greater adoption behavior. Further, perceptions of system quality are theorized to contribute to user trusting beliefs. The results of a free simulation experiment validated the proposed model.

Keywords: Anonymity, trust in IT, trust, system quality, identifiability, adoption

Introduction

A limiting factor in the understanding and evaluation of information security risks is the lack of reliable information about information security threats: hacking attacks, data theft, and damage due to malware (Brusil et al. 2005). Due to the sensitivity of this information, organizations have been hesitant to share this information with others for fear of security and liability risks inherent in information disclosure (Geer et al. 2003; Hovav et al. 2003). As a means of mitigating these risks, anonymizing systems have been proposed. Anonymizing systems are information systems that provide anonymity as a central capability. Anonymizing systems may provide anonymity by concealing the identity of its users and/or by disassociating data from their originator through a perturbation process. Examples of anonymizing systems for general Internet use include Anonymizer.com (Goldschlag et al. 1999) and the TOR network (Verlier et al. 2006). Anonymizing systems specifically designed to share sensitive information in an anonymous way include the CERIAS Incident Response Database (CIRDB) (Rezmierski et al. 2005) and the Trusted Query Network (TQN) (Vaishnavi et al. 2006). These and similar systems are receiving increasing research attention as the need to share sensitive information anonymously increases.

However, because anonymizing systems are relatively uncommon, user attitudes towards such systems are poorly understood and therefore user adoption may be limited. For example, as with all new technologies, users may feel reluctant to adopt anonymizing systems until more information is learned about them (Gefen et al. 2003b). Users of new systems risk failure to successfully adopt the systems. However, users of anonymizing systems face an additional risk: that the anonymity provided may somehow fail and expose the user to the negative consequences of data disclosure. Thus, in order for a user to adopt an anonymizing system, the risks of adoption failure and anonymization failure must first be diminished in the mind of the user.

Although the benefits of anonymizing systems are compelling for situations requiring the sharing of sensitive information, it is unclear whether users will trust such systems enough to adopt them in a meaningful way. If users place little confidence in the reliability or anonymizing capability of these systems, potential benefits will be lost.

The research objective of this study is to test a theoretical model of trust in anonymizing systems. The model is designed to answer the research question, “Does users’ trust in anonymizing systems affect their adoption of such systems?” Two secondary objectives are to determine (1) whether users' trust in the system affects their perception of the anonymity of the system and (2) how perceptions of the quality of the system affect trusting beliefs.

A free simulation experiment was employed to test the theoretical model. The results show that perceptions of system quality and beliefs in the trustworthiness of information provided by the system are important predictors of user adoption. Trust in the system did not lead to higher perception of anonymity. However, perceptions of anonymity did lead to increase user adoption.

The rest of the paper is organized as follows. In section 2, literature on trust, anonymity, and system quality is reviewed and the hypotheses of the model are stated. Section 3 describes the methodology used and section 4 summarizes the results. Section 5 discusses the contributions and implications of the findings, followed by a short conclusion.

Literature Review and Hypothesis Developement

The research model is presented below in Figure 1. The theoretical basis for the model is the Theory of Reasoned Action (Fishbein et al. 1975b), which holds that beliefs lead to attitudes, which in turn lead to intentions and ultimately behaviors.

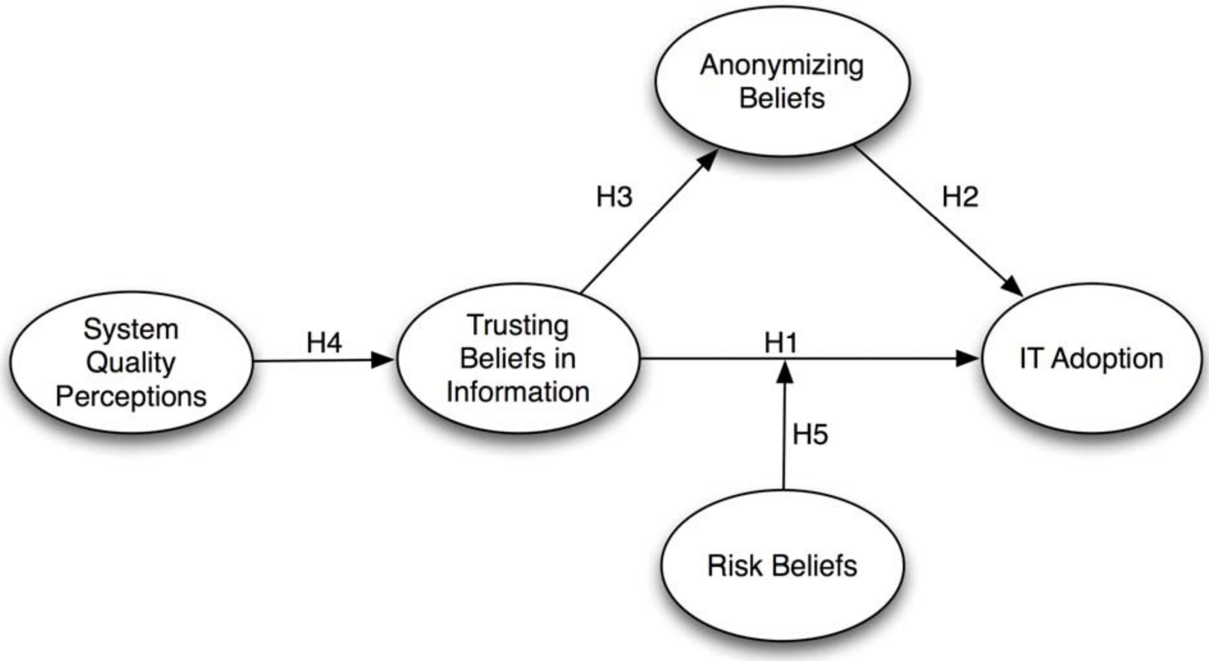

Figure 1. The Research Model

For theoretical concision, attitudes and intentions will be excluded from the model. Davis (1989a) has shown that attitudes are insignificant in the presence of beliefs in empirical testing. Other TRA-based studies have excluded actual behavior on the grounds that intentions are a close approximate of actual behavior (McKnight et al. 2002f) since previous research has demonstrated a strong correlation between intentions and behavior (Sheppard et al. 1988; Venkatesh et al. 2000). This study takes a different tact in that intentions are excluded. Not only are behaviors and intentions closely correlated, but behavior also implies a consonant intention.

The following sections will describe how the constructs of the model fit within this general framework.

Trusting Beliefs in the IT Artifact

The process of progressing from beliefs to intentions to behaviors has been found to be highly amenable to the formation of trust. McKnight et al. theorized and found empirical support that trusting beliefs, trusting intentions, and trusting behaviors comprise the cognitive process by which a truster determines whether or not to place trust in an unknown trustee (McKnight et al. 1998).

Although the concept of trust involves important differences, depending on whether the object of trust is a person or a technology, trust in IT and trust in people are similar in that they both require the truster to rely or depend on the object of trust (McKnight et al. 2005). In the case of an IT, people trust the IT when they rely and become dependent on the functionalities of the IT. Recent research has found evidence that the trust formation process occurs when an IT artifact, rather than a business or organization, is the object of trust (Komiak et al. 2006; Lippert 2001b; Wang et al. 2005). In these studies, it was found that people do form trusting beliefs toward IT artifacts (i.e., whether or not people perceived the IT artifact to possess dependable/useful characteristics). These trusting beliefs then strongly predicted trusting intentions (i.e., whether or not people were wiling to depend on the IT artifact).

Trust in people has typically been measured in terms of benevolence, competence, and integrity (Mayer et al. 1995a). In past research, this trust sub-constructs have been applied to IT artifacts by recognizing the human tendency to ascribe human characteristics to inanimate objects. A body of research has found that people consciously and unconsciously place trust in technology through anthropomorphization, attributing to technology human characteristics such as agency (Friedman et al. 1997); personality, friendliness, and helpfulness (Reeves et al. 1996); morality or responsibility (Muir 1987; Muir 1994; Muir et al. 1996) as well as, it is argued, benevolence and credibility (Cassell et al. 2000; Wang et al. 2005). Utilizing these findings, Wang and Benbasat (2005) found evidence supporting the extension of McKnight et al.'s (2002) trust constructs of integrity, benevolence, and competence to online recommendation artifacts (Wang et al. 2005).

An incorporation of anthropomorphization into the evaluation of trust in IT may be appropriate for IT artifacts that rely on recommendation agents, as in Wang and Benbasat (Wang et al. 2005), and/or where the artifacts are designed to appear or behave in human-like ways. However, the justification for applying anthropomorphization to all conceptualizations of trust in other IT artifacts appears to be more tenuous. Wang and Benbasat (Wang et al. 2005) observe that although anthropomorphic attributes apply well to online recommendation agents, other conceptualizations of trust may be more suitable for other forms of technology. Thus they express the need for future research to identify other aspects of trust that may be unique to technology artifacts and that are not presented as if they were taking on human-like qualities (Wang et al. 2005). Accordingly, the present research does not examine trust in IT artifacts through anthropomorphization, but rather seeks to employ conceptualizations of trust that are more appropriate to IT artifacts in general, and anonymizing systems specifically.

In this study, trust is conceptualized as relying on the most salient feature of the anonymizing system: the information shared among users of anonymous system (Mayer et al. 1995a). Because users of anonymizing systems are anonymous, the accountability of users is low and the possibility for opportunistic behavior is high (Zimbardo et al. 1970). Therefore, users of anonymous sharing systems are forced to trust that the information provided through the system is accurate in order to rely upon the information. This trust in the information provided by the system is conceptually a logical converse to the construct of *perceived deception* found in deception studies which is conceptualized in terms of accuracy, truthfulness, and representativeness (Grazioli et al. 2000b). Since users of the anonymizing have no way to verify data shared through the system, use of the anonymizing system requires first a trusting belief that the information is accurate. Thus, the higher the user's trust in the information provided by the system, the more likely the user will be to adopt the system. Consistent with the foregoing, the following effect is hypothesized:

H_1: Trusting beliefs in information will positively affect IT adoption.

Anonymizing Beliefs

Anonymity is the condition of being unidentifiable. Actions are anonymous when they cannot be linked to their originating actor. Previous research has shown that peoples' beliefs about their state of anonymity substantially impact their behavior. Zimbardo et al. found that when persons believe they are anonymous, "a lowered threshold of normally restrained behavior" results (Zimbardo et al. 1970). On the other hand, when individuals sense that they are identifiable, anti-social behaviors are curtailed (Diener et al. 1976; Festinger et al. 1952; Price 1987; Reicher et al. 1994). In summary, previous research has shown that if a behavior is associated with risks of being identified, the behavior is restrained. When anonymity removes risks of identification, the behavior increases.

In the context of IT, beliefs in anonymity are important when an IT-related behavior involves risks of being identified, such as the sharing of sensitive information. In such scenarios, it is theorized that beliefs that a system can provide anonymity will substantially increase user intentions to adopt the system. Accordingly, it is hypothesized that:

H_2: Anonymizing beliefs will positively affect IT adoption.

Trusting Beliefs in Information and Anonymizing Beliefs

Trusting beliefs in an IT artifact represents an overall attitude toward the effectiveness of an IT. McKnight observed, "trust in IT is a general assessment of the technology that probably affects other IT perceptions, such as relative advantage or usefulness of the technology. Thus, it may influence beliefs and attitudes that affect intentions to use a technology" (McKnight et al. 2005, p. 332). In regard to an anonymizing system in which providing anonymity to users is a defining feature, trusting beliefs in the reliability and accuracy of information provided through the system would necessarily affect beliefs towards the anonymizing capability of the system. For example, a perception that information provided through the system is unreliable could undermine the belief that the system is successful in providing unfailing anonymity. Accordingly, this relationship is hypothesized as follows:

H_3: Trusting beliefs in information will positively affect anonymizing beliefs.

System Quality

System quality is a major component of the DeLone and McLean model for IS success and later respecifications (DeLone 2003; DeLone et al. 1992; Seddon 1997). Seddon defines system quality as "whether or not there are 'bugs' in the system, the consistency of the user interface, ease of use, quality of documentation, and sometimes, quality and maintainability of the program code" (1997, p. 246). Nelson et al. (2005) identify five additional aspects of system quality which may also impact trust: reliability, response time, accessibility, flexibility, and integration. Additionally, user interface elements such as navigational layout and graphical design have also been found to be important aspects of system quality (McKnight 2005).

System quality attributes are relevant to the concept of trust because recent research suggests that technical aspects of IT artifacts do affect users' willingness to trust (Gefen et al. 2006c). For instance, McKnight et al. (McKnight et al. 2002d) found web site quality to be a stronger predictor of trusting beliefs (0.51) than either reputation (0.39) or structural assurance of the Web (0.10). Further, research has indicated that perceptions of system quality can serve as important cues for trust formation in an IT artifact, much in the same way that people use available cues to form trusting beliefs about others (Gefen et al. 2006c). In interacting with IT systems, observable system quality attributes can strongly influence the formation of trusting beliefs, and indirectly, trusting behaviors. McKnight observes:

> Trust in technology is built the same way as trust in people. When users first experience technology, signals of well-done user interfaces and good vendor reputations will build trust. Reliable, dependable, quality IT performance is the key

> over time… …The entire system infrastructure should demonstrate quality (2005, p. 330).

However, beyond this recognition of a link between system quality and trust, little IS research has investigated this connection. An exception is the website quality stream of literature, which often gives tacit consideration of the concept of trust. In two extensive and independent literature reviews of website quality, both Field et al.(Field et al. 2004a) and Wolfinbarger and Gilly (Wolfinbarger et al. 2003) show that risk and security concerns are a major components of a plurality of website quality studies. Because perceptions of security and risk are closely related to trust (Chellappa et al. 2002; Featherman et al. 2003; Salam et al. 2003), trust is arguably an implied component of many website quality studies. This tacit accordance with trust research indicates the viability of integrating system quality attributes into a model of trust in the IT artifact in general, and trust in information provided, specifically.

H_4: System quality perceptions will positively affect trusting beliefs in information.

Risk Beliefs

Risk is closely related to the concept of trust. Trust has been defined as a “willingness to take risk” and the level of trust can be an indication of the amount of risk one is willing to assume (Schoorman et al. 2007). Trust is often conceptualized as a means of coping with perceived risks (Gefen et al. 2003b) — the greater the risk perceived in a given situation, the greater the amount of trust required to cope with the risk (Schoorman et al. 2007). Mayer et al. further conceptualize the relationship between trust and risk as an interaction effect in which perceived risks moderate the influence of trusting beliefs on trusting behaviors (1995a). Risk beliefs are defined as “the trustor's belief about likelihoods of gains or losses outside of considerations that involve the relationship with the particular trustee” (Mayer et al. 1995a, p. 726). Importantly, risk beliefs are independent of the characteristics of the trustee. If risk beliefs are high, the trusting intentions of the trustor will be reduced.

Conversely, in situations with low risk, the trusting intentions of the trustor will be higher. In either case the characteristics of the trustee are unchanged. Given this interactive relationship, the following moderation effect is hypothesized:

> H_5: *Trusting beliefs in information will positively affect IT adoption less for individuals with high risk beliefs than for individuals with low risk beliefs.*

Research Design

In order to test the theoretical model, a free simulation experiment was performed involving a simulated anonymizing system based on the TQN model (for a brief description of the TQN model, see Appendix 3G). Free simulation experiments are a form of experiments in which treatment levels are not predetermined but levels range freely in accordance with how participants interact naturally with the simulation (Fromkin et al. 1976b; Gefen et al. 2003f). This has the advantage of allowing an unscripted interaction with the anonymizing tool, allowing a better simulation of its usage in real-world scenarios. TQN was selected as the model of the simulation because of its anonymizing and information sharing capabilities and its applicability to a wide range of contexts (Vaishnavi et al. 2006).

Simulation Procedures

Participants logged onto an experimental web site and read a statement of informed consent. Upon agreeing to take part, participants read instructions about the inventory ordering simulation. Next, the participants took part in three practice rounds of the simulation to get a feel for the tool and to see how the rules of the simulation work. After the practice rounds, the participant played a competitive game in which he/she competed against other players using an online ordering tool. However, participants were not told that their group members were actually computer agents programmed to share the same information with every participant. This uniformity eliminated the effects of group dynamics that might have otherwise added variation to the simulation.

The task involved forecasting future demand for a product using simulated sales data supplied to each participant. Participants were informed that their performance in the simulation task would affect the amount of compensation they would receive. While all participants received some minimum compensation, top performers earned an additional prize. After being introduced to the task and seeing how the anonymizing system works within the context of the simulation, participants at their option inputted their expected demand forecast information into the anonymizing system. The anonymizing system offered the advantage of sharing the group consensus of how much inventory to order without divulging the specific order amount for any single participant. This worked by anonymously collecting the sales information and displaying the presumed aggregate of the sales forecasts to all (virtual or real) participants. Once participants given the opportunity to learn the group consensus through the TQN system, participants were then asked to input their product order amount into the simulated ordering system. Once this information was inputted, the actual demand for the period was displayed as well as an evaluation of the participant's performance. If inventory was over the amount actually demanded for the period, a holding cost was charged for each item of surplus inventory. If inventory was under the amount actually demanded, a stockout cost was charged. This process was repeated over six rounds, with new forecast data for each round. At the end of all rounds, the total dollar inventory amount was totaled to determine the performance of the participant.

After the free simulation, participants took a posttest consisting of items representing the independent variables of the study (see Appendix 3A for a list of items). The dependent variable, *IT adoption*, was not measured via the survey, but was instead observed within the simulation, thus helping to reduce the threat of common methods bias (Podsakoff et al. 2003a). It was calculated as the absolute value difference between the TQN recommendation order amount and the order placed by the participant. In this way, the dependent variable shows the degree to which the participant trusted and relied upon the recommended TQN amount, with an amount of zero indicating full reliance on the TQN recommendations. Although Cook and Campbell point to the threat of reliability in measuring latent constructs using a single measure (1979a), Straub et al. (2004a) point out that in certain situations, a single measure is most appropriate. Such is the case in the present study because TQN adoption is an observed variable, and is therefore not subject to threats of reliability associated with self-response survey items.

Measures and Instrumentation

After the free simulation experiment was administered, participants took a survey which measured the strength of their trusting, risk, and anonymizing techniques, and their perception of quality in the anonymizing system. These constructs and their associated items are summarized in Table 1 along with their associated measures. All items were adapted from previously validated instruments (Boudreau et al. 2001a).

Table 1. Construct measurement items

Construct	Type of Variable	Nature of Construct	# of Items	Source
IT Adoption	DV	—	1	Observed variable
Trusting Beliefs in Information	IV	Reflective	5	Grazioli et al. (2000b)
System Quality Perceptions	IV	Formative	7	Wang et al. (2005) Montoya-Weiss et al. (2003)
Anonymizing Beliefs	IV	Reflective	3	Pinsonneault (1996)
Risk Beliefs	Moderator	Reflective	3	Malhotra et al. (2004a)

Sampling Frame

The sample for this experiment was drawn from introductory courses of information systems. Although use of student samples has been criticized for weak generalizability (Gordon et al. 1986a), business students are likely to become managers who may require anonymization tools in the future (Remus 1986). Additionally, since anonymizing tools have limited deployment, actual managers are likely not have any prior experience with anonymizing tools and may in this aspect be no different than business students. Further, when the purpose of an experiment is to test theory, convenience samples can effectively falsify whether a theory is applicable to a larger population (Calder et al. 1981). Moreover, homogeneity of a sub-sample provides a more severe test of theory by reducing statistical error that could obfuscate systematic violations of theory (Calder et al. 1982). For these reasons, the sample is believed sufficient to test the theoretical model.

Descriptive Statistics

In all, 117 participated in the simulation and survey. Of these, 56 percent were male and 44 percent were female. The average age of participants was 24, while the average years in college was 3. Sample descriptive statistics are summarized in Table 2.

Table 2. Descriptive Statistics for Sample

Variable	Average	Minimum	Maximum	STD
Age	24	18	50	6
Years in College	3	0	4	0.9
IT Adoption	78	0	356	74
	Female	Male		
Gender	44%	56%		

Data analysis

Partial least squares (PLS), a components-based structural equation modeling (SEM) technique was used to evaluate the theoretical model. PLS is an appropriate statistical tool given its capabilities in evaluating formative models (Chin et al. 2003c) (Gefen et al. 2000a). Where as covariance-based SEM techniques such as LISREL can evaluate formative models under certain conditions, PLS is much more flexible in this respect. Further, PLS is better suited for theory development, as opposed to LISREL which is preferred for testing of established theory (Chin et al. 1996; Chin et al. 2003c; Gefen et al. 2005d). The specific PLS software package used was SmartPLS 2.0 (Ringle et al. 2005).

Before testing hypotheses, the measurement properties of the model were thoroughly tested. Reliability and convergent and discriminant validity tests are documented in Appendix

3B; analogous tests for formative measures are presented in Appendix 3C. The hypothesized moderating relationship is explored in Appendix 3D. The threat of common methods bias is assessed in Appendix 3E. Finally, the influence of control variables is examined in Appendix 3F. The results of all of these tests show that the model meets the rigorous standards expected of IS positivist research (Straub et al. 2004a).

Results for Theoretical Model Testing

The results of the hypothesis tests of the theoretical model are shown pictorially in Figure 2. The predictive ability of PLS models are demonstrated by significant path coefficients that are at or above .20 as well as high R^2. With two exceptions, the model shows good predictive power.

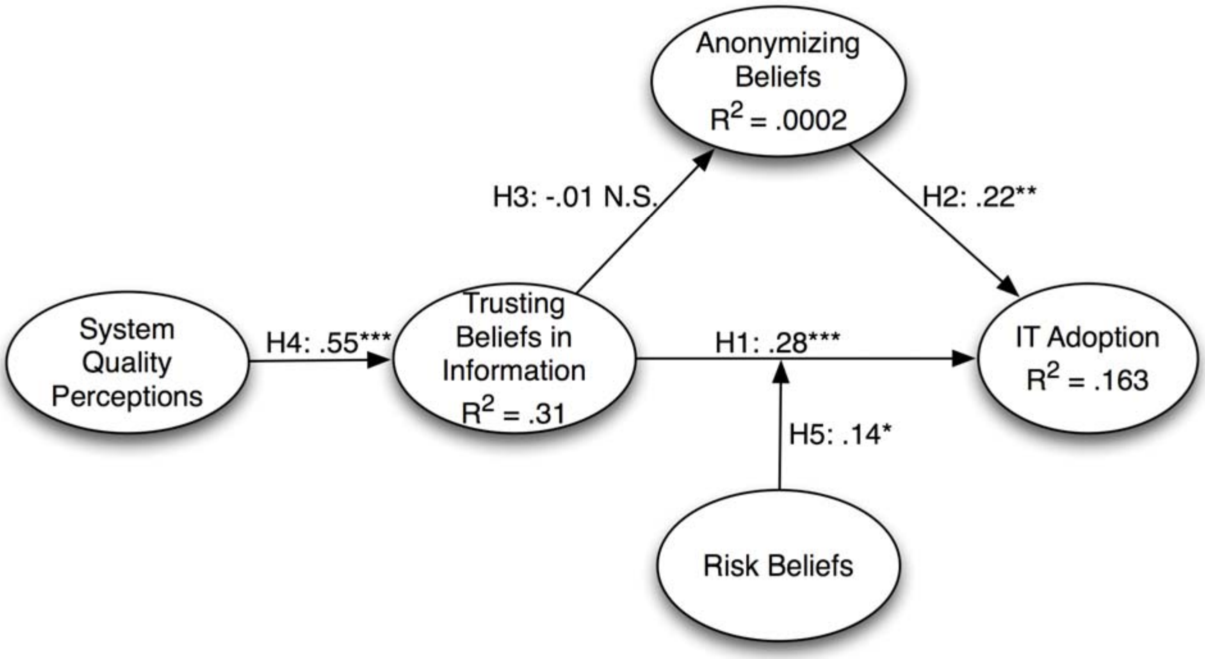
Anonymizing Beliefs $R^2 = .0002$
H3: -.01 N.S.
H2: .22**
System Quality Perceptions
H4: .55***
Trusting Beliefs in Information $R^2 = .31$
H1: .28***
IT Adoption $R^2 = .163$
H5: .14*
Risk Beliefs

Figure 2. Results of Hypothesis Testing
(*p<0.05; **p<0.01; ***p<0.005)

The results for specific hypothesis tests are summarized in Table 3. While hypothesized relationships between trusting beliefs and IT adoption (H1) and from anonymity to IT adoption (H2) were supported, the link between trusting beliefs and anonymity was not (H3). Because of the lack of support for this last relationship, the partial mediation role expected of *anonymity* was not further investigated (Baron et al. 1986a). The relationship between system quality and trusting beliefsfound strong support, whereas the presumed moderating effect of *risk beliefs* was not. On this last point, it should be noted that the moderating path in the model is shown to be significant (.14; $p < .05$). However, an F-test of the change in R^2 for the moderating effect advocated by Carte and Russell was shown not to be significant (2003), therefore hypothesis H5 was unsupported despite the significant path (a full analysis of the hypothesized moderating effect is treated in Appendix 3D).

Table 3. Summary of Hypotheses

Hypotheses and corresponding paths	Supported?
H1. trusting beliefsin Information → (+) IT Adoption	Yes
H2. Anonymizing Beliefs → (+) IT Adoption	Yes
H3. Trusting Beliefs in Information → (+) Anonymizing Beliefs	No
H4. System Quality Perceptions → (+) Trusting Beliefs in Information	Yes
H5. Risk Beliefs moderation of trusting beliefsin Information → (+) IT Adoption	No

Power Analysis

Because two relationships were found to be insignificant, a power analysis was performed to determine whether adequate power was achieved to detect the presence of all effects in the model. First, the rule of ten heuristic was used as an ex-ante power estimate, which calls for a sample of ten times the most complex regression relationship in the model (Barclay et al. 1995; Chin 1998b). Since the most complex relationship entails four predicting paths[9], the rule of ten suggests a sample of 40 is sufficient. However, because PLS requires larger sample to evaluate smaller paths (Chin et al. 1999), and because of recent criticisms of PLS analyses with insufficient samples (Marcoulides et al. 2006) (Goodhue et al. 2006), a sample several times this suggested number was obtained.

A post-hoc power analysis was also performed using the formula provided by Cohen

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[9] The construct *IT adoption* involved four incoming paths, viz., *trusting beliefs* to *IT adoption* and *anonymity* to *IT adoption*, and two paths necessary to evaluate the moderating effect: *risk beliefs* to *IT adoption* and *risk beliefs**trusting beliefs* to *IT adoption*.

(1988b). In this analysis, an alpha level of .05, 5 predictors, a sample of 117, and observed R^2 of .163 in the dependent variable yields an observed power of .97. Since this number well above the accepted threshold of .80 (Cohen 1988b), it is not likely that the insignificant paths observed in the model were a result of insufficient power.

Discussion and Contributions

An analysis of the results of the model provides several contributions, which are summarized in Table 4 below. First, this study represents the first systematic examination of user adoption of anonymizing systems. Because anonymity is a relatively new capability of information systems, it is important to understand users' expectations of anonymity and how they evaluate the condition of anonymity with the system. The results of the model analysis show that anonymizing beliefs are a significant determinant of IT adoption. This implies that anonymity is a feeling, as well as a state of being provided through a system. Users of anonymous systems should therefore be assured of their anonymity through clear descriptions of how the system is able to provide anonymity. The anonymity of users of the anonymizing system should be emphasized to give confidence to other users of the system.

Table 4. Contributions

Element of Research	Contribution
Trust in Anonymizing Systems	First model to examine the role of trust in the adoption of anonymizing systems.
Trusting Beliefs in Information	Trusting beliefs in information does affect users' adoption of anonymizing systems
Anonymizing Beliefs	First to look at how anonymizing beliefs affect adoption of anonymizing systems. Anonymizing beliefs do affect adoption of anonymizing systems.
System Quality	Shows that system quality leads to higher levels of trust in the context of anonymizing systems.

First, the results of the analysis of the model show that trust in information is an important predictor of adoption of an anonymous information sharing system. Although trust in IT artifacts is already understood to be an important user adoption construct, it is unclear which characteristics are most important for the development of trust across different forms of IT artifacts (Wang et al. 2005). This is especially true of anonymizing systems which have seen little user interaction due to their recent development. Because anonymity implies low accountability (Zimbardo et al. 1970), users of anonymous information sharing systems are forced to trust that the information provided is accurate in order to rely upon the information. The findings of this study indicate that, beyond the anonymizing capabilities of the system, users' willingness to trust the information provided by the anonymizing system should also be considered.

Finally, this study affirms previous research that system quality is a strong predictor of trust in IT (Vance et al. 2007). System quality remains an understudied aspect of information systems success and it is therefore unclear which aspects of system quality best engender trust in IT artifacts. Further, researchers believe that the most important aspects of system quality vary by type of IT artifact (Nelson et al. 2005). However, this breaks new ground by conceptualizing system quality as a formative construct composed of a variety of highly cited aspects of system quality, rather than examining aspects of system quality in isolation. System quality seems to be the technical corollary to competency or integrity in people, both which concepts are highly related to trust (Mayer et al. 1995a). A clear implication is that the higher the system quality perceived by users, the more trust will placed in IT. Since perceptions of system quality are crucial, it is crucial that aspects of the system which users can observe demonstrate high quality, regardless of the level of quality the internal workings of the system are. This implies that user interface design, ease of use, and consistency should all be carefully designed to communicate a sense of quality to users of the system.

Limitations and Directions for Future Research

The research study is has several limitations. First, because this study involved a free simulation experiment, its generalizability may be limited to experimental settings. Additionally, because this study involved an anonymous order sharing system, the results may also be bounded in their generalizability to different scenarios requiring anonymity.

Another generalizability limitation in this study may be the use of students, who may exhibit differences from users with managerial experience (Remus 1986). Future research could survey actual managers to see whether results substantially differ from the findings of this study.

Another limitation may be that although participants risked losing monetary rewards for divulging their order choices, participants may still not have perceived sufficient risk for the moderating effect of *risk beliefs* to be significant. Future research could examine the moderating effect of risk using experimental manipulations that more substantially induce a sense of risk in an experimental task.

Conclusion

While the benefits of an anonymizing system are compelling, it is unclear whether users will trust such systems enough to adopt them in a meaningful way. If users do not fully adopt anonymizing systems due to low confidence in the reliability or anonymizing capability of the system, the potential benefits of these systems will be lost. For this reason, the principal contribution of this study is the finding that trust leads to greater adoption of anonymizing systems. Additionally, anonymizing beliefs were also found to significantly affect IT adoption. Perceptions of system quality had an indirect effect on IT adoption through trusting beliefs. The results generally support the model, demonstrating that trust, perceptions of system quality, and anonymity are key determinants of user adoption of anonymizing systems. In addition to technological considerations, designers of anonymizing systems should be cognizant of how users perceive the anonymizing capability of the system and should take steps to engender trust in potential users of the system. An understanding of these issues will improve the effective design and increase the likelihood of user adoption.

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CHAPTER 4: IS YOUR WEB SITE CREDIBLE? HOW SOURCE CREDIBILITY AFFECTS CONSUMER TRUST IN E-COMMERCE WEB SITES

Anthony Vance
CIS Department
J. Mack Robinson College of Business
Georgia State University
Research Center in Management and Organization (DRM/CREPA)
Université Paris–Dauphine
Anthony@Vance.name

Paul Benjamin Lowry
Information Systems Department
Marriott School
Brigham Young University
Paul.Lowry.PhD@gmail.com

Greg Moody
Management Information Systems
Joseph M. Katz Graduate School of Business
University of Pittsburg
gmoody@katz.pitt.edu

Taylor M. Wells
Operations and Decision Technologies
Kelley School of Business
Indiana University
tmwells@indiana.edu

Bryan Beckman
CIS Department
J. Mack Robinson College of Business
Georgia State University
bbeckman@cis.gsu.edu

Abstract

Research on online trust-building cues, such as the inclusion of privacy seals and assurance statements on company Web sites, has produced conflicting results. Some previous research has found that privacy policies affect trust, while privacy seals do not; however, other work has found the opposite to be true. Other evidence suggests that branding alliances may be more effective than either privacy seals or assurance statements in generating consumer trust.

To date, using a variety of theories, most research has provided narrow explanations for the single effects of trust-building cues, but it has not considered how these effects work in an integrated model. The objective of this study is, therefore, to provide a comprehensive model that explains the effects of a variety of trust-building cues, using the single theoretical view of Source Credibility theory. We situate our model within a nomological network of trust, to aid the comparison with past findings.

The results of a free simulation experiment testing our model showed that both brand image and perceptions of privacy assurance decreased perceived risk. Of these, brand image was more effective in decreasing perceived risk and increasing trust. As a result, we recommend the use of brand alliances, wherever possible, as an effective technique to increase consumer trust.

Keywords
Source credibility, trust, e-commerce, trust transference, Web site quality, privacy seals, assurance statements, branding

Introduction

"To be persuasive we must be believable; to be believable we must be credible."

— Edward R. Murrow

Trust is a critical factor in the success of e-commerce (Gefen et al. 2003d), and there is a rapidly growing body of IS research that examines how to increase trust (Gefen et al. 2006a). In the trust formation process, an individual looks for available cues regarding the trustworthiness of a trustee (Blau 1964a). When interacting with a vendor on the Internet, a consumer relies on cues and signals from the vendor's Web site because the consumer is not able to view, experience, or interact with the company in a direct fashion as one would off-line (Gefen et al. 2004; Lim et al. 2006b). Consumers use peripheral cues, such as Web site features, to infer information about the vendor (e.g., credibility, believability, benevolence); these cues allow the consumer to make a judgment of trust. Previous research has shown that these cues include, but are not limited to, privacy seals (Hui et al. 2007); the perceived Web site quality of the Web site (McKnight et al. 2002c); perceived information about company size (Jarvenpaa et al. 1999); hyperlinks (Stewart 2006; Stewart 2003); and privacy statements (Anton et al. 2007).

Of these cues, privacy seals and assurance statements have received the most attention (Anton et al. 2007; Rifon et al. 2005). However, evidence varies regarding the effectiveness of both privacy statements and privacy seals, compared to other trust cues. Hui et al. (2007) conducted exploratory experiments and found that privacy policies affected trust, while privacy seals did not, a conclusion that was also supported in a study by McKnight et al. (2004). Metzger (2006), Bélanger et al. (2002), and LaRose and Rafon (2006) found the opposite to be true—privacy seals increased trust more than privacy policies did. Other recent trust research has pointed to the effectiveness of branding alliances in increasing trust and has indicated that branding alliances may be more effective at increasing consumer trust than either privacy policies or privacy seals (Lowry et al. 2008).

With the confusion over how effectively privacy seals and assurance statements increase a potential consumer's trust with a Web site, it is notable that many Web sites post both privacy seals and statements about the company's privacy practices. The question then arises as to whether companies should refrain from posting these statements or should discontinue memberships with privacy seal providers entirely. Furthermore, if other Web site features are better able to increase trust, which features should companies implement or more strongly emphasize on their Web sites?

We identify two limitations of previous research on trust-building cues that obfuscate answers to the above questions. First, these past studies approach trust from a variety of theoretical perspectives, including privacy calculus (Dinev et al. 2006), social contract theory (Malhotra et al. 2004b), service quality (Zeithaml et al. 2002), system quality (Vance et al. 2008), and TAM (Loiacono et al. 2007), among others. This diversity of theories inhibits our understanding of trust-building cues by compartmentalizing their effects. For example, system quality may adequately explain how cues of user interface aesthetics build trust (Vance et al. 2008), but it does not attempt to explain how privacy seal cues build trust. Other theories are similarly limited in their explanatory power across different cues. Theorizing individual effects of trust-building cues has merit, but a comprehensive explanation of trust-building cues could provide greater theoretical concision and allow the effects of various cues to be directly compared.

A second limitation is that previous studies vary greatly in their dependent variables and also differ in their conceptualizations of trust, both theoretically and methodologically. For example, some studies of trust-building cues use risk as the dependent variable and avoid a direct examination of trust (Salam et al. 2003; LaRose and Rifon 2007). While others examine risk as an outcome of trust (Jarvenpaa and Tractinsky 1999), as an antecedent (Dinev and Hart 2006), and as a concurrent phenomenon (Pavlou and Gefen 2004). Father, the utilization of trust in previous research varies drastically. Many studies focus on trusting intentions (McKnight et al. 2002), while others focus on trust in a vendor or individual (Stewart 2006), or even a generalized trust (Gefen 2002). As each theory in previous research has different assumptions about trust, it is difficult to compare results across studies as different antecedents and dependent variables are utilized in each study along with the location of a trust-related construct in the theoretical model, as demonstrated by the different relationships of risk and trust. This dissimilarity in the effects of trust hinders a meaningful comparison of past trust research studies.

To address these problems, the research objective of this study is to formulate and test an integrative comprehensive model, which can explain the effects of a variety of trust-building cues, using a single theoretical view. To do so, we have drawn primarily on the source credibility theory of Hovland et al. (Chaiken et al. 1994; 1951-1952), a robust theory that explains the effects of a broad array of peripheral cues and signals on consumer attitudes. Because of its explanatory power and wide applicability, source credibility has been extended, applied, and validated in scores of studies and contexts, including marketing, advertising, political science, and social science (e.g., Golberg et al. 1990; Pornpitakpan 2004). However, source credibility has seen limited use in the IS field.

To illustrate the effectiveness of our model in explaining a variety of trust-building cues, we examined, in an experimental setting, the simultaneous effects of privacy assurance statements, privacy seals, and co-branding on increasing trust. Further, to aid comparability of our findings with past trust research, we situated our model within the nomology of trust created by McKnight et al. (2002e).

The remainder of the paper proceeds as follows. First, we draw primarily on source credibility theory—and expand its explanatory power by explaining it against the elaboration likelihood model (ELM) and the theory of reasoned action (TRA)—to formulate a theoretical model that predicts how cues of source credibility increase trust. Next, we integrate our model with the nomological network of trust of McKnight et al. (2002e). We then present the results of a free experiment designed to test our theoretical model and conclude by discussing the contributions of this paper and potential for future research.

Theoretical Model

Source Credibility Theory

In order to explain how e-commerce vendors can influence the likelihood that buyers will purchase from an unknown online Web site, we built our baseline theory on source credibility theory. Source credibility was first delineated by Hovland et al. (1953; 1951-1952) in the field of communication, in response to the need to explain the influences that change attitudes in people. This idea has been significantly built on in further studies (Chaiken et al. 1994; Sternthal et al. 1978).

Source credibility is the degree to which the source of a message is perceived to be believable, likeable, respectable, or competent, in the mind of the message recipient (Chaiken et al. 1994; Hovland et al. 1951-1952; Sternthal et al. 1978). Source credibility explains how individuals are persuaded to believe the source of a message. As an important distinction, *credibility* pertains to believability, whereas *trust* pertains to dependability (McKnight et al. 2007). Previous research indicates that the credibility of sources serves as an antecedent for trust, particularly in an online shopping context (Doney et al. 1997; Sénécal et al. 2004). Furthermore, Xiao and Benbasat (2007b) claim that individuals quickly form trusting beliefs in credible sources, even without firsthand knowledge of these sources.

Despite the widespread applicability of source credibility, few studies have used the theory in the IS domain. Related IS studies often only apply source credibility as a construct in a larger model, rather than fully implementing source credibility. Ko et al. (2005) used source credibility as a key IV, in a model that predicted knowledge transfer from consultants to clients in enterprise system implementations. Poston and Speier (2005) partially built on source credibility research by looking at the effects of inclusion of credibility indicators and content ratings in knowledge management systems. Similarly, Xiao and Benbasat (2007b) showed that the credibility of the provider of recommendation agents was able to influence the adoption of these agents. In related studies, McKnight and Kacmar (2007) turned from considering source credibility to looking at the related construct of information credibility, which does not focus on the source. Lowry et al. (2008) performed a large online experiment and found that Web sites that were co-branded with higher-image sponsors gained increased consumer trust Web site and also increased intention to purchase and return. Source credibility is even less used in the context of online research, where positive signals and cues may be even more important, because fewer cues are available in the leaner online environment.

As the essence of trust is to convince the truster to believe that the trustee will behave in an expected manner and not take advantage of the truster, we believe that source credibility is an ideal theory to explain the way online vendors can foster consumer trust through implementation of specific Web site features. For example, the credibility of Web sites may be able to be bolstered through the display of privacy seals, assurance statements, evidence of alliances with known third parties, and so forth. Next, we explain the underlying mechanisms of source credibility and explain its adaptation in the context of our study.

Hovland (1953; 1951-1952) theorized that attitudes can change through persuasion and that the key factors affecting the persuasiveness of a message are (1) *target* *characteristics* (e.g., intelligence or self-efficacy of message recipient); (2) *source characteristics* (the most important being message credibility); (3) *message characteristics* (the nature of the message itself); (4) *cognitive routes,* where two routes are possible: (a) a central route where a recipient is given information that they are motivated to evaluate, with the intention that a logical conclusion will result in an attitude-changing conclusion; (b) a peripheral route where the recipient is encouraged to ignore the content and evaluate the source for an attitude-changing conclusion.

Given this background, source credibility initially only addressed *source characteristics* as the means of persuading change in attitude. The theory predicts that people are more likely to be persuaded (manifested through changing beliefs and attitudes and gaining behavioral compliance) if the communication source is seen as credible. This theory further explains that the stronger the source credibility, the stronger the positive effects in matters of opinion. To be persuaded, an individual must accept the material; and this acceptance is influenced by the material's source, which becomes a powerful message cue in itself. Whereas information content may be believable even if a source is not believable, the content is less likely to be accepted—and therefore trusted—because of this additional negative cue.

Extending to Dual-Process Models

Given this baseline theory, the elaboration likelihood dual-process model addresses the role of cognitive routes when dealing with source credibility by explaining the way people process messages in changing attitudes. The elaboration likelihood model (ELM) (Petty et al. 1986) builds on Hovland's conceptualization of two cognitive processing routes in attitude change. ELM posits that individuals process information with varying degrees of elaboration, on an elaboration continuum from low- to high-thought processing. High-thought processing is elaborate cognitive processing of information that occurs on the central route and relies on the quality of the argument to change attitudes. Low-thought processing is affective processing that occurs on the peripheral route and relies on cues or feelings to change attitudes. Research has shown that credibility, likeability, and attractiveness of the message source are the most likely cues used in the peripheral route (Sussman et al. 2003).

Important to our purposes, the affect used in peripheral process is also used directly in cognition as an input to judgment. This is further explained in the affect infusion model (AIM) that explains how affect can serve as a key input in cognitive processes involving judgments and the formation of beliefs (Forgas 1995). In particular, AIM shows how, in heuristic-processing scenarios, affect becomes information used in cognitive judgments and is referred to as "affect-as-information" (Dunn et al. 2005; Forgas 1995).

Two notable studies in IS extend source credibility theory with ELM. Sussman and Siegal (2003) primarily build on ELM to create a theoretical model of information adoption that places information usefulness as a key moderator in the information adoption process. Bhattacherjee and Sanford (2006) include source credibility as a key IV into an extended ELM, used to predict information technology acceptance. Both of these studies are important extensions into adoption and acceptance research. Whereas studies utilizing the theory of reasoned action (TRA) and the technology acceptance model (TAM) excel at explaining how beliefs predict intentions that impact behaviors, they are not as effective at explaining how a message source and message characteristics influence attitude change that can then impact behaviors (Sussman et al. 2003).

We build on the extensions of source credibility and ELM made by Sussman and Siegal (2003) and Bhattacherjee and Sanford (2006), with several important differences: First, rather than focusing on adoption behaviors based on TAM and TRA, we are interested in what encourages inexperienced users of an unknown Web site to have trusting beliefs and intentions toward a Web site, based on McKnight et al.'s trust model (2002e) and TRA. On a high level, TRA predicts that the combination of one's subjective norms and one's attitude toward a behavior predicts one's behavioral intention, which then predicts actual behavior (Ajzen et al. 1973).

Like most TRA extensions, McKnight et al.'s (2002e) trust model excludes direct consideration and manipulation of subjective norms because these are not as readily changeable as attitudes; we also embrace this assumption. In their model, the pertinent attitude toward behavior is trusting beliefs, and the pertinent behavior intention is the intention to transact. Because behavior has been consistently shown to follow behavioral intentions, McKnight et al. also follow most TRA research by not measuring actual behavior; we also embrace this assumption. Furthermore, our previous explanation of AIM is what allows us to use "affect-as-information" derived from source credibility in the peripheral route to directly predict conceptualization of trusting beliefs.

Second, by combining ELM and TRA in our context, we make some assumptions and choices that are different from the other two IS studies and that result in unique theoretical contributions. Both of these studies (Bhattacherjee et al. 2006; Sussman et al. 2003) focus on testing and measuring both argument quality and peripheral cues in the form of source credibility. Using an organizational consulting context, Sussman and Siegal actually measure argument quality of email messages in terms of their message persuasiveness from consultants to consulting clients. They then also look at source credibility in terms of a client's perception of the level of expertise of the writer of the email. Bhattacherjee and Sanford step up a level of abstraction by looking at acceptance of a document management system. In their case, argument quality is transformed into the quality of information provided during a training session on the system, and source credibility is the perception of expertise that the trainees have of the trainer.

Our context is far less personal than the other two studies, as it does not involve interaction between people. Instead, we examine individuals who are inexperienced with a previously unknown Web site to judge its credibility and trustworthiness and to see if they would be willing to engage in trusting behaviors with the Web site (e.g., transact or disclose personal information). By setting the information quality of a Web site constant and by using inexperienced users with no specific Web site expertise, we assume a situation where the processing of peripheral cues is the forced route, as would be predicted by other ELM-based source credibility studies (e.g., Bhattacherjee et al. 2006; Pornpitakpan 2004; Smith et al. 1991; Sussman et al. 2003). Hence, we eliminate argument quality from our model and solely focus on peripheral cues from source credibility. Our high-level combination of ELM and TRA (using McKnight et al.'s trust model) in our context is depicted in Figure 1 (items in grey are removed from the theoretical development and measurement of our model).

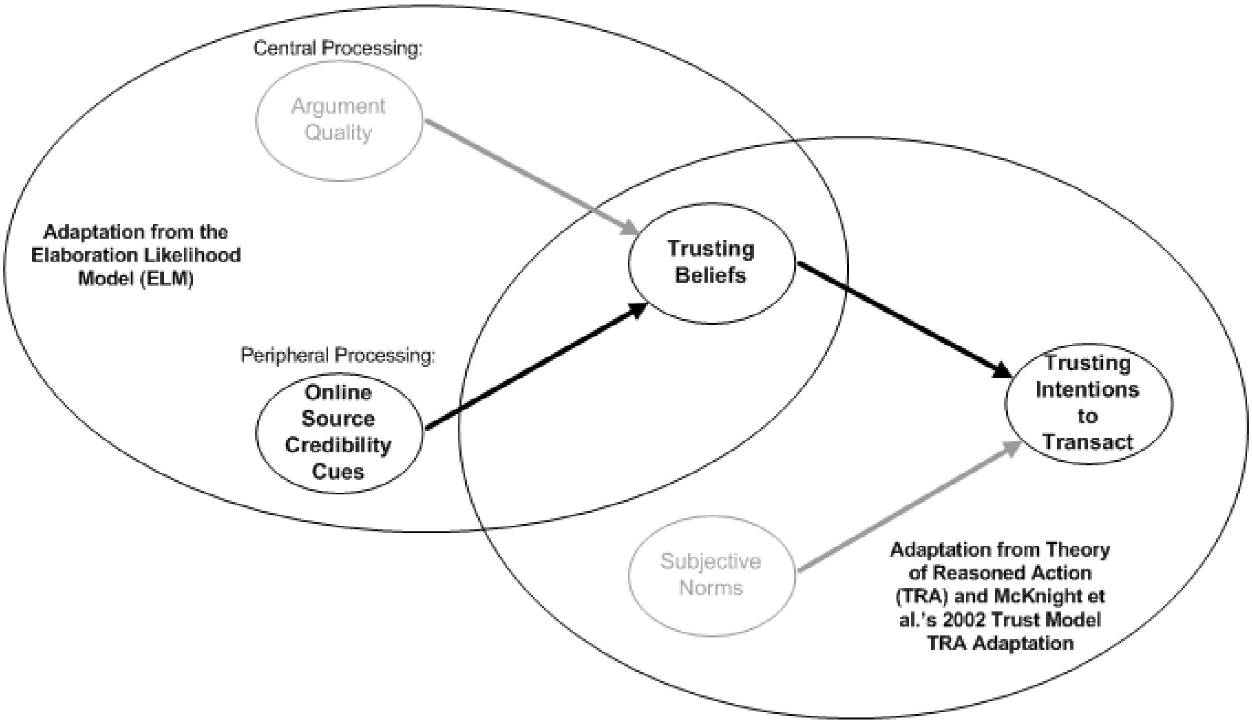
Central Processing:
Argument Quality
Adaptation from the Elaboration Likelihood Model (ELM)
Trusting Beliefs
Peripheral Processing:
Online Source Credibility Cues
Trusting Intentions to Transact
Subjective Norms
Adaptation from Theory of Reasoned Action (TRA) and McKnight et al.'s 2002 Trust Model TRA Adaptation

Figure 1. High-Level Combination of ELM and TRA in a Web Site Trust Context

A large body of research has also shown that source credibility is more likely to be salient where the product is high involvement, where favorable attitudes are shown toward the brand, and when high risks are involved (Pornpitakpan 2004). Our theoretical model proposes that third-party privacy seals and privacy and assurance statements can be effective cues to indicate source credibility (Golberg et al. 1990), perceived expertise, and perceived reputation. By manipulations of these online features, we expect to manipulate assurance perceptions that affect perceived risk and the initial trusting beliefs that a potential consumer forms towards the Web site. We also posit that brand image and perceived Web site quality are instrumental cues of credibility for a potentially risky, unknown Web site and that these peripheral cues will increase or decrease initial trusting beliefs, depending upon how they are interpreted by a consumer. Our source credibility-trust model is depicted in Figure 2.

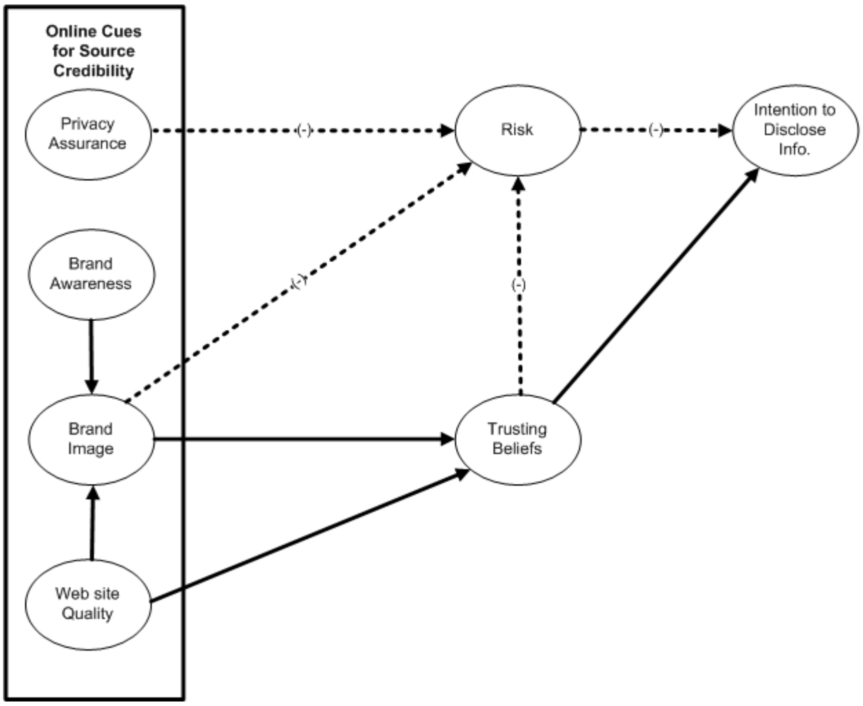
Online Cues for Source Credibility
Privacy Assurance
Brand Awareness
Brand Image
Web site Quality
Risk
Intention to Disclose Info.
Trusting Beliefs
(-)
(-)
(-)
(-)

Figure 2. Source Credibility-Trust Model

Finally, to increase the comparability of our model with past trust research, we fully incorporate the trust nomology developed by McKnight et al. (2002e). In their nomology, disposition to trust and trust based in institutions will also impact intentions to transact. We also include McKnight et al.'s dependent variable, intention to transact, to further enable comparability with prior studies. Given this additional nomology, we present our full model along with hypotheses in Figure 3. Model support and hypotheses are explained in the following section.

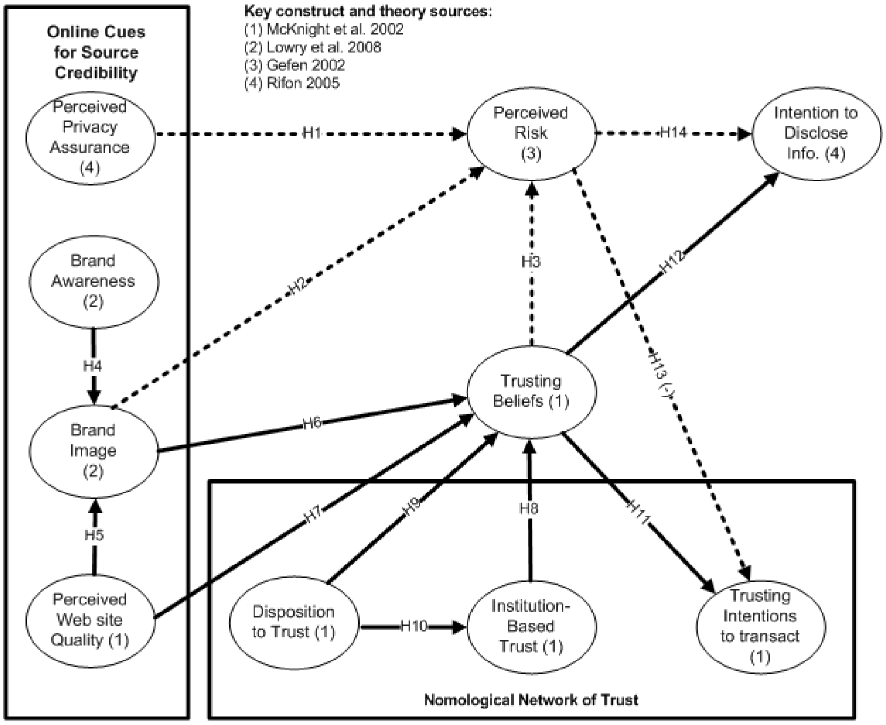
Online Cues for Source Credibility
Key construct and theory sources:
(1) McKnight et al. 2002
(2) Lowry et al. 2008
(3) Gefen 2002
(4) Rifon 2005
Perceived Privacy Assurance (4)
Brand Awareness (2)
Brand Image (2)
Perceived Web site Quality (1)
Perceived Risk (3)
Intention to Disclose Info. (4)
Trusting Beliefs (1)
Disposition to Trust (1)
Institution-Based Trust (1)
Trusting Intentions to transact (1)
Nomological Network of Trust
H1
H2
H3
H4
H5
H6
H7
H8
H9
H10
H11
H12
H13 (-)
H14

Figure 3. Our Extended, Operationalized Model

Hypotheses

Predictors of Perceived Risk

In our research of trust-building cues, we found that privacy seals and assurance statements are designed to reduce perceived risk. Many studies examining these cues therefore include risk as a key endogenous (and often mediating) variable. By adding perceived risk to the model, we are better able to explain the effects of assurance statements and privacy seals on trusting intentions, and our findings are more comparable with prior studies through increased nomological validity.

In this first section, we propose the predictors of perceived risk. *Perceived risk*, in the context of this study, is the probability of experiencing a negative outcome in an online shopping-related transaction by a consumer (Malhotra et al. 2004b). Perceived risk has been studied for several decades in other fields but was first applied to online exchanges by Jarvenpaa and Tractinsky (1999). Subsequently, many other studies have focused on the role that perceived risk has in an online context, particularly in its relationship with trust (e.g., Dinev et al. 2006; Gefen 2000b; Gefen et al. 2000b; Malhotra et al. 2004b). In the next sections, we explain how perceived privacy assurance, brand image, and initial trusting beliefs can reduce perceived risk.

Perceived Privacy Assurance Decreases Perceived Risk

We first propose how perceived privacy assurance decreases perceived risk. Several studies have examined the effects of privacy mechanisms (e.g., third-party seals or formal privacy or assurance statements) on individual actions and intentions. These studies have examined seal effects that include disclosure of personal information (Bélanger et al. 2002; Hui et al. 2007; Metzger 2006), purchase intentions (Bélanger et al. 2002), trust (Lee et al. 2004; Metzger 2006), negative consequences (LaRose et al. 2007), and risk (Grazioli et al. 2000a).

While some researchers have examined the direct relationship between privacy mechanisms and outcomes such as information disclosure or purchase intentions (Bélanger et al. 2002; Metzger 2006), others have suggested that the effects of privacy mechanisms have only indirect effects upon these outcome variables (Grazioli et al. 2000a; Lee et al. 2004). As these features may have an effect upon transactions, it is important to understand the relationship between privacy mechanisms and other constructs that are antecedent to purchase behaviors.

When people view privacy mechanisms, they make judgments about whether the mechanisms provide any additional protection of privacy for their personal information. These judgments influence their individual perceptions of privacy assurance (Lee et al. 2004; Rifon et al. 2005). Furthermore, these perceptions may be influenced by the presence or strength of privacy mechanisms (Lee et al. 2004; Rifon et al. 2005). We define *perceived privacy assurance* (PPA) as an individual's belief that another party will protect private information. It is our contention that previously studied manipulations of seals, privacy statements, or other mechanisms actually influence beliefs and intentions through the perceived privacy assurance construct.

Privacy assurances may reduce consumers' risk when transacting online (Dinev et al. 2006; Milne et al. 2004). These assurance mechanisms provide some indication that the organization using them actually values consumer privacy and will act fairly in protecting personal information. Enrollment in a third-party seal program also signals to consumers that the organization is willing to face penalties if they do not comply with privacy policies (Metzger 2006), thereby increasing the perceived credibility of the Web site. Assurance mechanisms serve as signals to indicate the level of credibility that may be inferred to the Web site. More credible sources are more easily relied upon and able to change the attitudes of the receiver. An individual is able to transfer increased credibility to the unknown Web site due to the reputation and trust that is transferred by means of the credibility signal embodied in the privacy seal or assurance statement. As the individual can more accurately predict the probability of negative outcomes, the inherent risk of the situation is thereby reduced due to the signals of increased credibility available on the unknown Web site.

As expected, researchers have empirically found a negative relationship between privacy mechanisms and risk perceptions. In an experiment, Grazioli and Jarvenpaa (2000a) examined individual perceptions when presented with an actual commercial Web site or a fraudulent version of the site that contained additional privacy mechanisms. They proposed and found support for a negative relationship between assurance mechanisms and individual perceptions of risk. Lee et al. (2004) conducted a survey and similarly found a negative relationship between the effects of third-party privacy seals and risk perceptions. We extend these findings as follows:

H1: Perceived privacy assurance will reduce perceived risk.

Brand Image Decreases Perceived Risk

We now explain how brand image decreases perceived risk. Branding represents another important signal or cue of credibility (Herbig et al. 1997; Pornpitakpan 2004). A *brand* is “a name, term, sign, symbol, or design, or combination of them which is intended to identify the goods and services of one seller or group of sellers and to differentiate them from those of competitors” (Lowry et al. 2008, p. 442). A key goal of branding is to increase brand equity. *Brand equity* is a measure of the favorable market outcomes that would not have occurred if the same product or service did not have that brand associated with the product or service (Lowry et al. 2008). Brand equity is created when a consumer has an awareness of a brand and an associated positive image that together create unique brand associations (Lowry et al. 2008). Hence, to achieve market advantages, it is critical for a Web site to increase brand knowledge. *Brand knowledge* (Lowry et al. 2008) is composed of brand image and brand awareness.

Brand image defines the set of negative or positive associations a consumer has with a brand (Keller 1993; Lowry et al. 2008). Traditional marketing techniques improve brand image by creating positive associations with a brand, by describing positive attributes, carefully choosing memorable names, creating positive secondary associations, and so forth (Keller 1993). A brand operates as a source of credibility when consumers interpret the brand as a signal of quality and rely on the brand in making purchase decisions (Herbig et al. 1997).

An advertisement or message containing a brand with high brand image would therefore evoke greater source credibility and influence behavior more than would the same message with a brand of low brand image (Pornpitakpan 2004).

The positive effects of brand image can be partially shared with other brands through a *brand alliance*, a "short- or long-term association of two or more individual brands, products, and/or other distinctive proprietary assets" (Simonin et al. 1998, p. 31). Brand alliance is also an umbrella term for co-branding and similar techniques such as cross-promotion, joint marketing, and joint branding (Simonin et al. 1998). Brand alliances can apply to the context of e-commerce Web sites because such alliances can be symbolic through use of brand names or logos (Simonin et al. 1998). Brand alliances allow unfamiliar brands to share the image of higher-image brands.

The credibility of a brand with high brand image can be shared with a lesser or unknown brand in a brand alliance through a process of trust transference, meaning that trust placed in the well-known brand is transferred by means of recommendation or association (Doney et al. 1997; Millitnan et al. 1988; Stewart 2003). According to Doney and Cannon (1997), trust transference operates through the use of "proof sources," which can be factual evidence that corroborates the claims of an unknown party (Millitnan et al. 1988; Swan et al. 1985) or a clear indication that an unknown entity is associated with or recommended by a trusted party (Doney et al. 1997; Doney et al. 1998). In the case of a branding alliance, the well-known brand functions as a source of credibility from the high-image brand to the unknown brand. The credibility signal from the known source allows the individual to more accurately assess the current situation of probable outcomes and thereby reduce the probability of an adverse outcome resulting from engaging in a behavior with the unknown Web site. As such, these sources of credibility, by means of brand icons, logos, and co-branding arrangements, provide a mechanism for the individual to reduce the likelihood of a negative outcome and thus lower the level of perceived risk.

Supporting this notion, Stewart (2003) found that when an unknown store had links to known stores, the consumer was more likely to infer trust in the unknown Web site. She posited that the trust was transferred from the links to known third parties on the unknown Web site. In a follow-up study (2006), she found that the transfer of trust could work in both directions (i.e., from the unknown Web site to the known Web site, and from the known Web site to the unknown Web site). Furthermore, the extent of the perception of a relationship between the two entities affected the degree that the trustee would transfer trust from one entity to the other. The effect of branding alliances in increasing trust in an unknown was also empirically tested by Lowry et al. (2008), who found that the presence of a well-known brand logo on an unknown Web site did increase consumer trust in the unknown Web site. Grewal et al. (1994) found that source credibility was significant in decreasing perceptions of perceived risk when purchasing an unfamiliar brand. Summarizing this section, we predict:

H2: Brand image will reduce perceived risk.

Trusting Beliefs Decrease Perceived Risk

Finally, in this section we propose how trusting beliefs decrease perceived risk. *Trust* has been defined as a willingness to make oneself vulnerable to actions of a trusted third party, based on the expectation that the other will behave in a predefined, expected manner (Gefen 2000b; Lowry et al. 2008; Mayer et al. 1995b). Trust is a commonly studied construct in e-commerce (Gefen et al. 2003d; McKnight et al. 2002e). Our study focuses primarily on initial trust, to better understand how trust is developed by consumers that are first visiting a Web site. *Initial trust* has been defined as the ability of the truster to believe and rely upon the trustee without any firsthand knowledge of the trustee (McKnight et al. 1998).

Initial trust is composed of two subconstructs: trusting beliefs and trusting intentions, hereafter referred to as *intention to transact*. *Trusting beliefs* are defined as the beliefs that a consumer holds that a Web site will act with benevolence, integrity, and competence toward the consumer (McKnight et al. 2002e). *Intention to transact* refers to the truster's being willing to depend, or intending to depend, on the trustee (McKnight et al. 2002e). Trusting beliefs are antecedents of intentions to transact, which affect the likelihood of engaging in a transaction behavior.

People frequently have a general perception that performing economic transactions over the Internet and with specific online entities is somewhat risky (Gefen et al. 2003d; Jarvenpaa et al. 1999; Lowry et al. 2008). This risk perception necessitates establishment of trust so that buyers will engage in online transactions. Moreover, this risk perception has been cited as one of the largest impediments to realizing the full economic potential of the Internet (Lim et al. 2006b; Pavlou et al. 2006). Risk, or the probability of adverse outcomes, is the antithesis of trust, the willingness to accept these negative outcomes. Thus perceived risk is reduced when the online vendor is perceived to be trustworthy (McKnight et al. 1998). This adverse relationship between trust and risk in the online context has support from many other studies. For example, Jarvenpaa and Tractinksy (1999) were the first to report that trust and perceived risk are negatively related in e-commerce transactions, and this negative relationship between risk and trust has been mirrored several times (e.g., Gefen 2000b; Gefen 2002a; Malhotra et al. 2004b). Similarly, in the present study, we replicate the previous predictions and findings that trust decreases perceived risk:

H3: Initial trusting beliefs will reduce perceived risk.

Online Cues that Affect Brand Image

Since brand image is a major IV in our model and affects both perceived risk and initial trusting beliefs, we now introduce the online cues that we believe are predictors of brand image: brand awareness and Web site quality.

Brand Awareness Increases Brand Image

Brand awareness is the partner construct of brand image, which creates the brand knowledge that is critical to creating brand equity (Keller 1993). *Brand awareness* is a consumer's ability to identify a brand under different conditions (Lowry et al. 2008). Brand awareness consists of brand *recognition* (a consumer's ability to recognize that he or she has been previously exposed to the brand) and brand *recall* (the ability of a consumer to generate the brand from memory given a related cue, such as a product category) (Lowry et al. 2008). Lowry et al. (2008) propose an associative network model of memory to explain and predict how increased brand knowledge increases brand image. While their causal mechanisms are too lengthy to repeat here, the basic premise of their model is that increased familiarity leads to increased preference, as seen in other studies. Furthermore, the strengths of the memory associations created by familiarity serve as signals or cues that increase the power of the heuristic processing when using familiar cues to jog memory. Here, we simply replicate these findings and predictions:

H4. Brand awareness will increase brand image.

Web Site Quality Increases Brand Image

Perceived *Web site quality* is an individual's overall perception of how well a Web site works and looks, particularly in comparison to other sites (McKnight et al. 2002e). Web site quality has been examined by a diverse number of studies within the IS (Galletta et al. 2004; Kettinger et al. 1997; Pitt et al. 1995) and marketing disciplines (Zeithaml et al. 2002). Most studies have conceptualized Web site quality as a formative construct composed of several subconstructs, with at least 30 different subconstructs of Web site quality identified in the literature (Field et al. 2004b).

Although there is no clear consensus as to which subconstructs are most important (Wolfinbarger et al. 2003), typical components of Web site quality include navigability (Loiacono et al. 2007), graphical style (Montoya-Weiss et al. 2003), and functionality (Zeithaml et al. 2002). Our conceptualization of Web site quality follows McKnight et al. (2002e), who defined Web site quality as a user's general perception of navigability, aesthetics, and functionality of the Web site.

Theoretically, the link between Web site quality and brand image is well explained by source credibility. Web site quality serves as a ready heuristic by which consumers infer the quality of the brand and its image, and the quality of the communicator's image affects the receiver's acceptance of a message (Giffin 1967). The quality of a Web site, including such attributes as visual appeal and layout design, add to the perceived credibility of the site and thus will influence consumer attitudes significantly (Galletta et al. 2004; Golberg et al. 1990; Stamm et al. 1994). Web site quality signals are discernable by a Web site viewer and will serve as a persuasive signal relative to the image of the brand. If a brand is associated with a poorly designed Web site (in terms of visual appeal and layout), an individual will transfer these negative associations with the Web site to the brand that is being advertised, discussed, or sold on the given Web site (Lowry et al. 2008). A higher-quality display of the brand will result in a more persuasive argument about the positive aspects of the brand and thereby increase its perceived image by the consumer, especially if the brand is unknown to the consumer or if the consumer has relatively little previous experience with the brand (Broniarczyk et al. 1994; Danaher et al. 2003). Because the perceived quality of the Web site serves as a cue for the image of the brand, particularly in the absence of previous experience with the brand, we hypothesize:

H5: Web site quality will increase brand image.

Predictors of Trusting Beliefs

The Effect of Brand Image on Trusting Beliefs

Just as we hypothesized that the process of trust transference enables brand image to reduce perceptions of perceived risk, we also expect that brand image will positively affect initial trusting beliefs. Brand image has a direct effect on initial trusting beliefs due to the trust transference process (Doney et al. 1997; Stewart 2006; Stewart 2003). Through this process, trust held for one entity is extended to another entity by virtue of association or endorsement (Doney et al. 1997; Stewart 2006; Stewart 2003). This is the theoretical basis for branding alliances, which are believed to significantly influence initial trusting beliefs in a little or unknown entity. Several studies have found empirical support for trust transference achieved through branding alliances (Lowry et al. 2008; Simonin et al. 1998), from a brand with high brand image to lesser-known entity.

The more positive the brand image that an individual associates with the brand on the Web site, the more readily will the individual be persuaded to have positive associations with that brand. The more positive attitudes that are held regarding the brand, the more likely that the consumer will transfer these positive attitudes to trusting beliefs about the brand and therefore will believe in the likelihood that the brand owner will behave in an expected manner. For these reasons, we hypothesize the following:

H6: Brand image will increase initial trusting beliefs.

The Effect of Web Site Quality on Trusting Beliefs

The theoretical link between Web site quality and trusting beliefs is well explained by source credibility. As noted earlier, Web site quality serves as a ready heuristic by which consumers judge the credibility of an online vendor (Chaiken et al. 1994; Dhamija et al. 2006) because the quality of the communicator's image affects the receiver’s acceptance of a message (Giffin 1967). An individual is readily able to infer the quality of the Web site in comparison to other Web sites with which that the individual is familiar. As such, the quality serves as a cue regarding the credibility of the unknown Web site as compared to other known Web sites. If the unknown Web site has better appeal, superb navigation, and increased clarity, the Web site viewer will infer that this Web site is of higher quality than other known Web sites; and thus, the reputation and credibility of this Web site is increased due to its perceived superiority to other known Web sites. This signal of increased credibility then allows the Web site viewer to more readily accept information available on that Web site, and its persuasive ability is greatly increased due to its perceived attractiveness and quality. By being more persuasive, the Web site is more likely to be trusted and relied upon by the individuals viewing it. Additionally, the quality of a website, including such attributes as visual appeal and layout design, add to the perceived credibility of the site, and thus will influence consumer attitudes more significantly (Galletta et al. 2004; Golberg et al. 1990; Stamm et al. 1994).

The theoretical link between Web site quality and trust is supported by several research studies. Everard and Galletta (2006) found that initial impressions of perceived Web site quality positively impact trust in a very short period of time. Ha and Perks (2005) conducted a study that found that increased experience with an effectively designed Web site increased the tendency of consumers to trust the Web site. Most recently, Lowry et al. (2008) found that Web site quality had a more substantial positive impact on trusting beliefs than did disposition to trust, institution-based trust, and brand awareness. Consistent with our theory and these previous findings, we posit:

H7: Web site quality will increase trusting beliefs.

Previously Tested Predictors of Trusting Beliefs

Additionally, previous research has found that initial trusting beliefs are also affected by one's disposition to trust and by institution-based trust (Lowry et al. 2008; McKnight et al. 2002e). We include these constructs in our model to increase nomological validity and to account for alternative explanations to our theory.

Institution-based trust is defined as the belief that present structural mechanisms are able to enhance the likelihood of completing a successful transaction with the online vendor (McKnight et al. 2002e). McKnight et al. predicted that institution-based trust is a positive predictor of trusting beliefs toward an Internet-based vendor. In a related study, McKnight et al. (2004) found that structural assurance positively affected trust in a Web site. They reasoned that consumers who have more trust in the Internet as a structural mechanism that enables sales are also more likely to trust individual Web sites, a claim supported in other studies (Gefen et al. 2003d; Kim et al. 2004; Lowry et al. 2008; Pavlou et al. 2004b). We replicate and extend these predictions and findings in our model:

H8: Institution-based trust will increase initial trusting beliefs.

Disposition to trust is defined as the extent to which a person displays a tendency to be willing to depend on others (McKnight et al. 2002e). McKnight et al. predicted that one's disposition to trust positively impacts both one's trusting beliefs and institution-based trust. In a related study, McKnight et al. found that one's disposition to trust positively impacted one's trust in a Web site (2004). This relationship was also supported in other studies (Gefen et al. 2004; Lim et al. 2006b; Lowry et al. 2008; Pavlou et al. 2004b). McKnight et al. believe the explanation for these outcomes is that one's disposition to trust is more relevant in online settings because these electronic relationships are devoid of personal experience or knowledge about the vendor (2004). We replicate and extend these predictions and findings:

H9: Disposition to trust will increase initial trusting beliefs.

H10: Disposition to trust will increase institution-based trust.

Predictors of Consumer Intentions

Trust researchers have found a strong relationship between trusting beliefs and intentions to transact. According to TRA (Fishbein et al. 1975a), beliefs lead to attitudes, which in turn lead to intentions and ultimately to behaviors. This process of progressing from beliefs to behaviors has been found to be highly amenable to the formation of trust. McKnight et al. (2002e) adapted Davis's more parsimonious version of TRA (Davis 1989b) to theorize that trusting beliefs, intentions to transact, and trusting behaviors describe the process by which a consumer places trust in an online vendor. Previous research has shown that trusting beliefs do positively influence a person's intention to use e-commerce Web sites (Gefen et al. 2003d; McKnight et al. 2002e; Wu et al. 2005).

A more specific form of intention common in IS trust literature is the intention to disclose personal information (Dinev et al. 2006; Malhotra et al. 2004b). *Intentions to disclose information* have generally been conceptualized as the likelihood that a given individual will disclose personal and confidential information to a specified entity or individual (Rifon et al. 2005). Studies focusing on consumer online privacy have adopted this dependent variable to show the effects of trusting beliefs on a person's willingness to disclose personal information to an e-commerce Web site. Because we theorize that co-branding and assurance mechanisms affect both intentions to transact and to disclose information, we include both intentions in our nomological net. This enables us to show the effects of our theoretical model on both forms of intentions and makes our findings more comparable with previous IS trust research. Accordingly, we hypothesize the following:

H11: Trusting beliefs will increase intentions to transact.

H12: Trusting beliefs will increase intentions to disclose information.

And the antithesis seems likely as well: individuals who perceive more risk associated with interacting with an online vendor will be less likely to participate in a transaction and disclose sensitive, personal information online (Jarvenpaa et al. 1999; Pavlou 2003b).

H13: Perceived risk will reduce intention to transact.

H14: Perceived risk will reduce intention to disclose information.

Methodology

The research methodology that was chosen for this study was a free simulation experiment in which participants interacted with a simulated Web site. Free simulation experiments are commonly used in IS experiments to increase realism and generalizability (e.g., Burton-Jones et al. 2006a; Gefen et al. 2003c; Gefen et al. 2003e; Vance et al. 2008). This form of experimentation has a long history in industrial and organizational psychology and is fully described in (Fromkin et al. 1976a)), which describes this approach as a field experiment in a laboratory setting. Per this methodology choice, our experiment did not have traditional control and treatment conditions; rather, conditions ranged freely as participants interacted naturally with the simulation Web site. After viewing the simulated site, participants answered questions on how they felt about the experience. These questions represented the exogenous and endogenous variables in the model.

Research Stimulus and Task

To provide an appropriate research stimulus for our participants in the free simulation experiment, we had them interact online with a fictitious travel-booking company Web site (MyTripCreator.com) that was carefully designed to be highly professional and usable and to mirror the look and feel common to sites such as Travelocity.com, Expedia.com, Orbitz.com, and others. A fictitious site was used to increase our experimental control and to prevent the intrusion of noise from branding and brand image of a known Web site. The fictitious site had its own domain name, activated SSL certificate and indicator, privacy seals, and an active privacy and security policy link.

Because the participants were students, we tried to frame the task in terms that they would understand and in a context that they would likely feel personally motivating and interesting. In particular, we chose a task that would potentially invoke personal feelings about brand image, Web site quality, trust, risk, privacy assurance, and self-disclosure. To do so, we asked them to imagine a scenario where they are graduating from college and preparing to enter the job market. They hear back from their dream employer and, due to an administrative oversight, are asked to make flight and hotel arrangements on their own to attend an interview in a couple of days. They try to book flights and hotels on commonly known sites such as Travelocity.com, Expedia.com, and Orbtiz.com, and they find no availability. In a panic, they contact their potential employer's administrative assistant, who has been in contact with the student. The assistant then informs the student that he or she could try a lesser-known Web site called MyTripCreator.com (our fictitious Web site) that has both flight and hotel availability for the specified time period. However, the assistant insists that, because the company has no working history with the site, the company will take no responsibility if the Web site is fraudulent or does not come through with the necessary flight and hotel bookings. Participants were informed that they would be reimbursed only for valid travel expenses. Participants were then asked to freely interact with the Web site to help determine what they thought about it and to determine the degree to which they would trust such a site and potentially transact travel arrangements with the site under the scenario they were given.

Experimental Procedures

Approximately two weeks before each participant participated in the actual experiment, participants received an email message with a personalized pre-experiment survey link and were asked to “sign up” for the experiment in order to participate. During this process, we received their initial consent to participate and, more importantly, we were able to gather all the pre-experiment measures. This time lag provided the advantage of decreasing mono-method bias, instrument fatigue, and hypothesis guessing.

At the time of participation in the experiment, all participants read the same online script and instructions, rather than receiving the instructions from a live facilitator. This allowed us to decrease potential facilitation effects, since the experiment took place at three major universities. Though the interaction with the Web site was a free simulation, to provide a little more structure and to ensure that all of the basic elements of the Web site were examined, we designed our Web site to force them to navigate through seven major views of the Web site before they could complete the post-experiment survey. This survey was also provided online and immediately followed the Web site interaction sequence. The measures used in the survey are fully explained in Appendix 4A.

Participants and Demographics

To improve generalizability of the study, a total of 764 undergraduate volunteer participants were recruited for this study from three different universities. 190 participants were from a large, private university in the Western U.S.; 270 participants were from a large public university in the Southern U.S.; 304 participants were from a large quasi-public/private university in the Eastern U.S. The demographic breakdown of the sample is as follows: age (μ=21.2, SD=3.4); years of higher-level education (μ=2.61, SD=1.3); gender (46.9% male and 53.1% female).

Data Analysis

We analyzed our theoretical model using partial least squares (PLS), using PLS-GRAPH version 3.0. PLS is especially suited for early theory development (such as seen in our paper) as opposed to situations where prior theory is highly developed. In the latter, further testing and extension are the primary objectives; and other methods, such as maximum likelihood or generalized least squares, are often preferred (Chin et al. 1996; Chin et al. 2003c; Gefen et al. 2005e). PLS is particularly helpful in cases such as ours that use a mix of formative and reflective indicators (Chin et al. 2003c). We document the procedures performed to validate our model in Appendix 4B. Our procedures included tests for factorial validity of reflective and formative indicators, common methods bias, and mediation effects. The results of our validation procedures show that our model meets or exceeds rigors standards expected in IS research (Straub et al. 2004b).

Results of Theoretical Model Testing

The predictive power of our structural model is summarized in Table 1. Chin (1998c) indicates that, to demonstrate meaningful predictive power of a PLS model, one needs to show strong loadings, significant weights, high R^2's, and substantial/significant structural paths. He indicates that standardized paths need to be close to .20 (and ideally .30 or higher) to indicate meaningful predictive power for the model. Thus we conclude that our model has excellent predictive power.

Table 1. The Predictive Power of the Model

Construct (latent variable)	Variance explained (R^2)
Brand Image	0.325
Perceived Risk	0.396
Trusting Beliefs	0.521
Intention to Transact	0.559
Intention to Disclose Information	0.280

Table 2 summarizes the hypotheses, path coefficients, and *t*-values for each theoretically predicted path. The results of our full model, including tests of ten relevant covariates, are documented in Appendix 4C. A summary of our final model appears in Figure 4.

Table 2. Summary of Hypotheses, Path Coefficients, and Significance Levels

Hypotheses and corresponding paths	**Path coefficient**	**t-value**	***Supported?***
H1. Perceived privacy assurance → (-) Perceived risk	(-0.108)	2.77**	Yes
H2. Brand image → (-) Perceived risk	(-0.069)	1.62 (ns)	No
H3. Trusting beliefs → (-) Perceived risk	(-0.469)	12.28***	Yes
H4. Brand awareness → Brand image	0.237	4.44***	Yes
H5. Perceived Web site quality → Brand image	0.474	11.81***	Yes
H6. Brand image → Initial trusting beliefs	0.462	9.93***	Yes
H7. Perceived Web site quality → Initial trusting beliefs	0.342	7.67***	Yes
H8. Institution-based trust → Initial trusting beliefs	0.055	1.54 (ns)	No
H9. Disposition to trust → Initial trusting beliefs	0.022	0.59 (ns)	No
H10. Disposition to trust → Institution-based trust	0.407	10.69***	Yes
H11. Initial trusting beliefs → Initial intention to transact	0.538	11.93***	Yes
H12. Initial trusting beliefs → Intention to disclose information	0.399	7.47***	Yes
H13: Perceived risk → (-) Initial intention to transact	(-0.293)	5.44***	Yes
H14: Perceived risk → (-) Intention to disclose information	(-0.186)	3.23**	Yes

(**p*< 0.05, ***p*< 0.01, ****p* < 0.001)

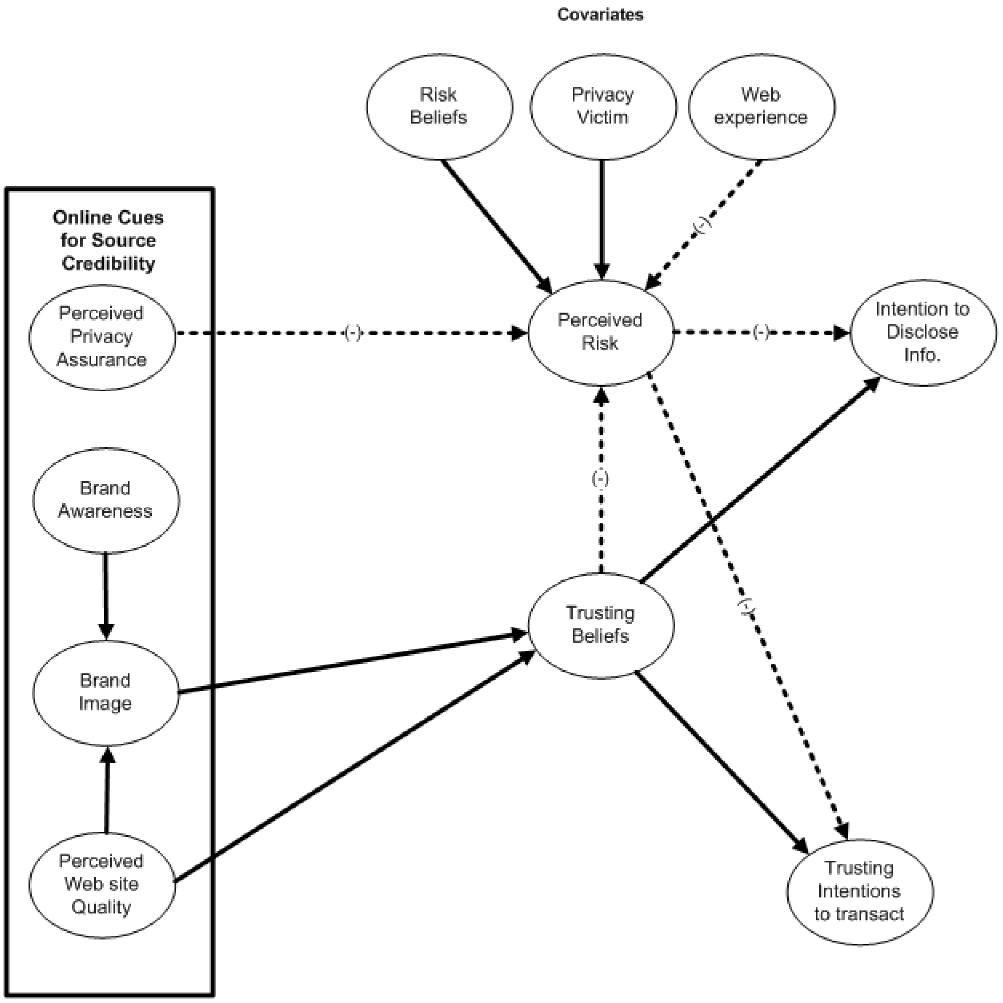
Covariates
Risk Beliefs
Privacy Victim
Web experience
(-)
Online Cues for Source Credibility
Perceived Privacy Assurance
(-)
Perceived Risk
(-)
Intention to Disclose Info.
(-)
Brand Awareness
(-)
Trusting Beliefs
Brand Image
Perceived Web site Quality
Trusting Intentions to transact

Figure 4. Summary of Final Model

Discussion

Summary of Results

Based on the analysis of our data, we found several important relationships that support our theoretical model, as previously summarized in Table 2. First, online cues of credibility from perceived privacy awareness were able to reduce the perceived risk from the Web site, while both brand image and Web site quality were able to positively impact trusting beliefs. Second, both brand awareness and Web site quality were able to positively impact brand image. Third, trusting beliefs negatively impacted perceived risk. Fourth, both perceived risk and trusting beliefs impacted both intentions to disclose information and to transact, in the expected directions. Additionally, we tested and found two covariates of perceived risk: subjects whose privacy had been compromised and the general Web experience of the subject. Finally, in our testing of McKnight et al.'s (2002e) nomological network of trust, we found only that disposition to trust positively impacted institution-based trust, neither of which constructs impacted initial trusting beliefs. Finally, we found no support for our second hypothesis, that brand image will negatively affect perceived risk. Although the results are in the correct direction, they are statistically not significant.

Contributions

Based on the above results, this study makes several contributions, which are summarized in Table 3.

Table 3. Research Contributions

Element of Research	Contributions
Source Credibility	Provides a powerful and versatile theoretical framework that can explain a range of trust-building cues as opposed to being specific to only one type of trust antecedent. This theory provides greater concision and allows the effects of multiple cues to be more easily explained and compared.
Simultaneous Comparison of Trust-building cues	Compares the effects of website quality, privacy seals and assurance statements, and branding alliances cues concurrently, which has not been done in any previous paper. Finds that brand alliances are the most effective trust-building technique when directly compared with privacy seals, assurance statements and Web site quality. This has important implication for designers of e-commerce sites.
Perceived Privacy Assurance	Defines a construct to explain why privacy seal and assurance statement mechanisms should impact the consumer's perception of risk in e-commerce. Provides evidence that these mechanisms do affect trusting intentions through the mediation of perceived risk.
Intentions to Disclose Information and Transact	Examines the effect of initial trusting beliefs on both intentions to disclose information and transact, aiding comparisons with past trust research. Finds that brand alliances are the most effective trust-building technique, an important implication for designers of e-commerce sites.
Disposition to Trust, Institution-based Trust	Confirms the supposition of McKnight et al. (2002e) that disposition to trust and institution-based trust will have less pronounced effects in the presence of more salient sources of trust. Examines the effect of initial trusting beliefs on both intentions to disclose information and transact, aiding comparisons with past trust research.
Nomological Network of Trust	Situates the effects of privacy seals and privacy statements within a nomological network of trust, thus providing a theoretical framework to better understand the conflicting results of past studies.
Trusting Intentions	Demonstrates that website owners can successfully influence the consumers to engage in a transaction through strategies that are controllable by the website owner, as opposed to being due to external factors outside of their control.

First, the key contribution of this paper is the application of source credibility theory to provide a comprehensive understanding of the effects of privacy seals, privacy assurance statements, branding alliances, and Web site quality on initial trust formation. In previous studies, the effects of these trust-building cues were separately examined through a variety of theories, as shown in Table 4. Although theorizing the effects of trust-building cues in isolation holds merit, this approach also compartmentalizes our understanding of the effects of trust-building cues.

Table 4. Theories Used to Explain Antecedents of Trust

Predictor of Trust	Present Theory	Past Theories
Privacy concerns	Source credibility	Privacy calculus, Dinev and Hart (2006); Social contract theory, Malhotra et al. (2004b)
Brand alliances		Associate network model of memory, Lowry et al. (2008)
Web site quality		Service quality (Zeithaml et al. 2002); TAM (Loiacono et al. 2007)

In contrast, the present study uses source credibility to provide a concise theoretical explanation of the effects of these constructs on initial trusting beliefs. Moreover, this theoretical common ground enables researchers to better compare and understand the effects of these constructs on initial trusting beliefs. Source credibility is a versatile theory, able to explain effects of a broad array of peripheral cues and signals attributable to a message source. The findings of this study show the utility of examining trust building through the lens of source credibility, which suggests that our understanding of other trust-building techniques may similarly benefit from an application of source credibility.

Second, this study helps to clarify the conflicting results of past studies of privacy seals and privacy assurance statements. As highlighted in the introduction, empirical findings are mixed with regard to the effectiveness of privacy seals and assurance statements to induce consumer trust in Web sites (Hui et al. 2007; Pollach 2007; Rifon et al. 2005). Because past studies used varying conceptualizations of risk and trust and used different dependent variables, the conflicting results have been difficult to reconcile. The present study clarifies past findings by (1) operationalizing the effects of privacy seals and privacy assurance statements within the construct of *perceived privacy assurance*, and (2) situating this construct within a nomological network of trust, as first created by McKnight et al. (2002e). Further, we include perceived risk in our model to allow comparability with prior studies that examined the effects of privacy seals and privacy assurance statements on risk. Likewise, we include intention to disclose information to enable comparisons with past privacy research that examined this dependent variable.

Because of our inclusive model, we are able to show findings that better explain past findings of privacy research. Consistent with Rifon et al. (2005) but contrary to Hui et al. (2007) and Metzger (2006), this study provides evidence that when consumers feel more trust towards a Web site, they are also more likely to divulge private information to that Web site. This behavior is essential to the success of e-commerce. Providing personal information enables the completion of online transactions, and privacy mechanisms may be effective means of encouraging the disclosure of personal information. By using privacy seals and assurance statements, e-commerce sites can help consumers feel less risk when engaging in a purchasing-related behavior with the Web site, which in turn increases their initial intentions to transact. Additionally, our study highlights and defines the importance of the perceived privacy assurance construct and its importance in influencing the perceived risk that a consumer has towards a given Web site.

Third, the results of our PLS analysis show that brand image has a stronger positive effect ($\beta = 0.462$ $p < 0.001$) on initial trusting beliefs than does Web site quality ($\beta = 0.342$, $p < 0.001$). This finding indicates that brand alliances may be a more effective trust-building technique than privacy seals, assurance statements, or Web site quality. The more pronounced effect of brand image on initial trusting beliefs is in accordance with our theoretical model. Source credibility explains that more credible sources of information act as more salient peripheral cues that better enable the transference of trust from a third party as opposed to non-credible sources. More credible sources, such as brands with strong brand image, should have a greater impact on initial trust than will peripheral cues such as privacy seals and privacy assurance statements that are less widely understood and appreciated by consumers. This is an important implication for designers of e-commerce Web sites, who have mainly focused on engendering consumer trust through Web site quality and privacy seals (Galletta et al. 2004; Lowry et al. 2008).

Fourth, our model uses two forms of intentions as dependent variables. Previous trust research has been somewhat divided over which dependent variable to use. Studies that examine purchasing behavior have generally relied on trusting intentions as the dependent variable (Gefen et al. 2003d; McKnight et al. 2002e), while studies focusing on the effects of trust on privacy have chosen the construct of intention to disclose information (Dinev et al. 2006; Hui et al. 2007; Malhotra et al. 2004b). We submit that the difference in dependent variables in privacy seals and assurance statement research partly explains the incongruity of findings. To enable greater comparability with previous findings and increase understanding of past results, this paper includes both intention to disclose information and the more general construct, intention to transact, as dependent variables. Not only does the use of two dependent variables aid comparability with past privacy research, but it also shows the utility of comparing both intentions to disclose information and intentions to transact simultaneously. The results of our model show that both dependent variables can be strongly predicted,[10] with a sizeable amount of variance explained ($R^2 = .559$ for initial trusting intentions; $R^2 = .280$ for intention to disclose information).

Fifth, the results of this study confirm the supposition of McKnight et al. (2002e); namely, that disposition to trust and institution-based trust will have less-pronounced effects on the formation of initial trusting beliefs in the presence of more salient sources of trust. The results of this study show that perceived privacy assurance, brand awareness, brand image, and Web site quality are significant predictors of initial trusting beliefs, and can explain over 50 percent of the variance. This finding is important because it indicates that e-commerce designers are capable of affecting the contributing factors most salient to forming initial trusting beliefs. With effective trust-building mechanisms, designers of e-commerce sites will be able to engender higher levels of initial trusting beliefs, even in those who may have a low disposition to trust or have low institution-based trust.

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[10] The PLS path coefficient from initial trusting beliefs to trusting intentions in our model is .711***; the path coefficient from initial trusting beliefs to intention to disclose information is .585***.

Limitations and Future Research Opportunities

By using source credibility as our theoretical frame, we were able to explain the impact of privacy mechanisms and brand alliances on constructs that influence purchasing behavior and the propensity to disclose personal information. There are many other factors that may influence the constructs of interest in our study. Pornpitakpan (2004) described how source, message, channel, receiver, and destination variables may interact further with source credibility. Additional research is needed to understand how these potential variables relate to branding, perceived risk, and trust. Additionally, we did not explicitly measure the source credibility that was perceived by subjects for each of the Web site features.

Another key factor that merits future research is the interaction of culture, which has been poorly studied in source credibility research (Pornpitakpan 2004). Some initial exploratory work examining the effects of culture on the development of trust online found significant cross-cultural differences (Jarvenpaa et al. 1999); however, others have called for further investigation into potential cross-cultural effects (Grabner-Krauter et al. 2003). This merits further investigation in cross-cultural contexts and in consideration of other potentially salient cultural dimensions.

Personal experience with a vendor or Web site is an important factor in the formulation of trust (Pavlou et al. 2004b). In this study, we control for general Web experience but do not control for experience with other travel Web sites. Further research should determine how strongly trust is influenced by experience with similar Web sites, separately from general Web experience.

Additional work should also examine the results of this study in relation to TRA models that include subjective norms, TPB models that include behavioral control, and ELM models that include argumentation quality (argument quality in the form of information quality as seen with (Bhattacherjee et al. 2006).

Personal relevance to the participant or product involvement is also critical in determining whether central or peripheral processing will occur (Sussman et al. 2003). While we created a task that is highly relevant to the students, the risk and relevance were still simulated; the artificiality likely may have made the task less relevant and more heuristic-processing oriented than with actual transactions, where the subjects are using their own money. Also, as we measured only intentions and not actual behaviors of subjects, our study is further limited in its ability to draw conclusions about actual consumer behaviors in similar circumstances.

The methodology that we used in this study also limits the generalizability of our study because we do not compare actual treatments of the privacy seals or brands. Since our methodology is manipulation free, future research should verify whether this model holds for actual seals and implementations with actual brands. This type of research could also identify whether known privacy seals or known brands are more effective in reducing perceived risk and increasing trust over less known or even fictitious seals and brands.

Additionally, as is common to most laboratory experiments, our study involves the use of student subjects and, as such, limits the generalizability of this study. This is somewhat mitigated through the use of subjects across three geographically dispersed U.S. universities. We feel that the use of student subjects is warranted for the context of this study, as students have high levels of experience with online shopping, and they are also highly price conscious, which may drive them to consider purchasing from Web sites that are less well known but provide lower prices. The task was designed to be appropriate for student interaction to increase realism.

Last, the theoretical richness of this model could be increased through future research. First, the definition of perceived privacy assurance that we used may be too closely tied to its operationalization and needs further clarification. Second, our model does not clearly specify the antecedents of perceived privacy assurances, brand image, and perceived risk. Future research could explore how perceived privacy assurances, brand image, and perceived risk could be either increased or diminished through various design factors or strategic decisions enacted by Web site owners. It is unclear whether a Web site could effectively control for and alter the perceptions of these variables with factors that are controllable by the e-commerce vendor.

Conclusion

Previous research on trust-building cues has produced a diversity of conflicting, or incomparable, results. This disparity in findings is largely due to the multiplicity of theories used to individually explain the effects of trusting-building cues. This study addresses this disparity by formulating and testing a comprehensive model that explains the effects of a variety of trust-building cues, using the single theoretical view of Source Credibility theory. Because our model is situated within a nomological network of trust, our findings are more readily comparable with findings of past trust research.

Our results show that both brand images perceptions of privacy assurance, decrease perceived risk. Of these, brand image is the more effective in decreasing perceived risk and increasing trust. As a result, we recommend the use of brand alliances, wherever possible, as an effective technique in increasing consumer trust.

Acknowledgments

We appreciate the insightful feedback and reviews from David Gefen, Harrison McKnight, Michael Gallivan, James Gaskin, Bryan Hammer, Detmar Straub, Karen Todd, and Laura Rawlins. We also appreciate the participants who gave us useful feedback at the following workshops: Georgia State University, February 22, 2008 and The University of Pittsburgh workshop on April 4, 2008. Finally, we appreciate support given for our data collections at Brigham Young University, Georgia State University, and The University of Pittsburgh, particularly with the following course instructors: Bonnie Anderson, Patrick Bateman, Brian Butler, Rachel Chung, Andrew Heary, Lynn McKell, Ray Meservy, Richard Moreland, Jacqueline Pike, and Charles Xiu.

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CHAPTER 5: CONCLUSION

Introduction

This multi-paper dissertation proposal examined trust in two under-explored areas of trust: (1) trust in the IT artifact and (2) antecedents of trust. Both areas have been cited in prior research as possible applications for trust in information systems (Gefen et al. 2008; Lippert 2001a). Although a quickly growing body of research has examined trust in e-commerce settings (Gefen et al. 2006b), to date research in these two areas has been sparse. The purpose of this dissertation proposal is to apply the concept of trust to these relatively unexamined areas of trust. This document reviews the potential contributions and limitations of these studies.

Research in the areas of trust in the IT artifact and trust and antecedents of trust are complimentary in that they both demonstrate the diverse and substantial effects that trust has on a broad range of IS applications. Until recently, trust was not considered relevant to IT artifacts. However, Chapters 2 and 3, along with recent evidence suggests that trust is an important consideration in user adoption and usage of a wide variety of IT artifacts. By acknowledging this component, developers can better design IT systems that will meet with more immediate adoption and usage in their intended user bases.

Similarly, antecedents of trust remain little understood (Gefen et al. 2008). Chapter 4 examines in depth how sources of credibility function as substantial antecedents of trust in online settings. Specific sources of credibility identified include privacy seals, privacy assurance statements, brand alliances, and website quality.

The findings of Chapter 4 demonstrate how trust can be enhanced by employing these trust-building mechanisms. In turn, trust reduces perceived risk and increases intentions to transact and disclose personal information.

Contributions

Contributions for Research of Trust in IT Artifacts

The results of Chapters 2 and 3 confirm that the extent to which trust (or lack of trust) in the IT artifact manifests itself will likely affect users' intention to adopt the IT artifact. This result lends further support to prior research findings (Wang et al. 2005, p. 90). However, beyond confirming prior research in this nascent research area, these studies indicate several relevant antecedents to the conceptualization of trust in the IT artifact. These studies find that trust in the IT artifact is directly influenced by system quality characteristics, such as navigational structure and or responsiveness and reliability. This is an important finding because it identifies aspects of trust in the IT artifact that are different from attributes related to trust in people. Thus, this research addresses the call for research in Wang and Benbasat to "examine whether the conceptualization of trust in IT artifacts should be extended to include other relevant beliefs" (Wang et al. 2005, p. 90). Given the findings of chapters 2 and 3, researchers of trust in IT artifacts should be better able to conceptualize and model trust in IT artifacts. Additionally, these results demonstrate to designers of IT artifacts that user trust placed in IT artifacts can be enhanced by giving proper consideration to design elements such as user interface considerations and system responsiveness.

A related contribution of these studies is the theoretical linkage between trust in IT artifacts and system quality streams of research. These chapters offer empirical evidence that significant overlap between these two research streams exist. Other system quality measures may likely be related to trust in the IT artifact. By leveraging system quality research already performed in marketing and IS, researchers of trust in IT artifacts may be able to advance knowledge in this domain much more rapidly than if research in trust in IT artifacts was performed in isolation.

For a contribution specific to Chapter 2, results show that culture can affect the degree to which users place trust in the IT artifact. As expected, a significant contrast between the low-trust French culture and the higher-trust US culture was found in the analysis. This has important implications for researchers of trust in IT artifacts because it demonstrates that IT artifacts are not culturally neutral. Rather, individuals of different cultures may exhibit markedly different attitudes towards placing trust in an IT artifact, which may translate into different levels of intention to adopt the IT artifact. Designers of IT artifacts may be advised to consider which cultures are most likely to use IT artifacts and make design decisions specific to the target culture. Such an approach may increase trust in IT artifacts and, in turn, lead to greater user adoption.

For contributions specific to Chapter 3, this study represents the first systematic examination of user adoption of anonymizing systems. Since anonymizing systems are a relatively rare, though growing, form of business IT, it is important to understand user expectations of anonymity and how they effect evaluations of the system. The results of the study show that trusting beliefs in information, anonymizing beliefs, and (indirectly) perceptions of system quality significantly affect users' intention to adopt information systems.

Contributions for Source Credibility as an Antecedent Trust

The findings of chapter 4 demonstrate that the source credibility is a powerful and versatile theory that can explain a range of trust-building cues as opposed to being specific to only one trust-building cue. Previous research has relied on different theories to explain the effects of trust-building cues individually. While theorizing the effects of trust-building cues in isolation still holds merit, a single versatile theoretical explanation provides greater concision and allows the effects of trust-building cues to be more easily compared.

In the past, assurance mechanisms were theorized to have a direct effect on trusting intentions (Bélanger et al. 2002; Metzger 2006). However, others have suggested that these mechanisms have an indirect affect (Grazioli et al. 2000; Lee et al. 2004). Further, we provide evidence that privacy mechanisms do affect trusting intentions through the mediation of perceived risk. This study is the first to provide a theoretical construct and theory for the effects of privacy mechanisms on trust, perceived privacy assurance is a novel antecedent of perceived risk and trusting intentions.

Previous papers on trust-building strategies have tended to focus on a single trust-building cue, which often led to conflicting results that are hard to reconcile. This study is the first to compare the effects of website quality, privacy seals and assurance statements, and branding alliances cues concurrently, which has not been done in any previous paper. By comparing these trust-building cues simultaneously, we found that branding alliances are the most powerful predictors of initial consumer trust.

To enable greater comparability with previous findings and increase understanding of past results, this paper includes both intention to disclose information and the more general construct intention to transact as dependent variables—both of which are driven by trusting intentions. Not only does the use of two dependent variables aid comparability with past privacy and trust research, but it also shows the utility of comparing both intentions to disclose information and intentions to transact simultaneously.

The findings of this study also confirm the supposition of McKnight that disposition to trust and institution-based trust will become insignificant in the presence of stronger antecedents for trust (in our case, website quality, brand image, and perceived privacy assurance).

Limitations

Limitations for Research on Trust in IT Artifacts

Several limitations for Chapters 2 and 3 should be recognized. First, because participants will interact with simulations rather than actual IT artifacts, external validity may be reduced. Second, because these studies used business students as participants in the experiments, the results of this study might be less generalizable to other populations (Gordon et al. 1986b). Future research should seek to perform similar experiments using non-student populations.

Third, chapter 2 contains the possibility of common methods bias because participant attitudes towards the independent and dependent variables were measured using the same instrument. Although this bias may be tested for, common methods bias remains a potential problem. Stronger designs would gather the dependent variable several weeks after the stimulation, which may not be practical for these studies.

Limitations for Research on Source Credibility as an Antecedent of Trust

Personal relevance to the participant or product involvement is also critical in determining whether central or peripheral processing will occur (Sussman et al. 2003). While a task was created that was highly relevant to the students, the risk and relevance were still simulated, which likely could have made the task less relevant and more heuristic-processing oriented than with actual transactions where the subject is using their own money. Also, only intentions were measured and not actual behaviors of subjects, which further limited the ability of the study to draw conclusions about actual consumer behaviors in similar circumstances.

The methodology utilized also limits the generalizability of our study as actual treatments of the privacy seals or brands are not compared. Since the methodology was manipulation free, future research should verify whether this model holds for actual seals and implementations with actual brands. This type of research could also identify whether known privacy seals or known brands are more effective in reducing perceived risk and increasing trust over less known or even fictitious seals and brands.

Additionally, as common to most laboratory experiments, the study involves the use of student subjects and as such limits the generalizability of this study. This is somewhat mitigated through the use of subjects across three geographically dispersed U.S. universities. Further, it can be argued that the use of student subjects is warranted for the context of this study as students have high levels of experience in regards to online shopping and they are also highly price conscious which may drive them to consider purchasing from websites that are less well-known but provide lower prices. The task was designed to be appropriate for student interaction to increase realism.

Conclusion

This dissertation examines two relatively unexamined areas of information systems research on trust: the IT artifact itself and antecedents of trust. The research studies presented in this dissertation demonstrates the substantial effect that trust can have on the adoption and usage of a wide range of information systems.

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APPENDICIES

Appendix 2A: Convergent and Discriminant Validity of Formative Constructs

Loch et al. (2003a) argue that convergent validity is obtained with their modified MTMM when indicators are significantly related to their intended composite construct. To do so, they extend the reasoning that considers that convergent validity can be assessed when measures of the same construct correlate significantly with one another, as argued by Campbell and Fiske (1959).

Formative indicators are also called “cause indicators” (Jarvis et al. 2003) in that they “cause” rather than “reflect” the latent variable. Four decision rules (Gefen et al. 2000c) have been suggested to distinguish formative constructs from the reflective ones. The first criterion is that the indicators cause the construct, and therefore the causality is from the indicators to the construct. Contrariwise, reflective indicators are caused by the construct. The second criterion is that unlike reflective indicators, formative indicators should not be interchangeable. The third criterion is that the items do not necessarily covary for formative indicators while they do for reflective ones. The fourth criterion is to determine whether the indicators have the same antecedents and consequences. While reflective indicators do need to have the same antecedents and consequences, formative indicators may have different antecedents and consequences.

While loadings have to be taken into consideration for reflective measures, weights provided in appendix Table A1 play this role for formative measures (Diamantopoulos et al. 2001b; Petter et al. 2007a). As the items of formative constructs represent a different facet of the construct, dropping a poorly represented item should necessarily be justified by theoretical arguments (Campbell et al. 1959). In the present study, no item has been deleted resulting from our analysis.

In order to assess convergent and discriminant validity for these constructs, we employed the modified MTMM technique used in a prior study (Loch et al. 2003a). The procedure described by Loch et al.(Loch et al. 2003a) has four steps. Step 1: Normalize the data set. Step 2: Multiply the values of the data by their individual PLS weight. Step 3: Sum up the indicators of each construct, creating a weighted score for each indicator and a composite score for each construct. Step 4: Create a matrix presenting inter-items correlation and item-to-construct correlation. Our dataset consisted of Likert scales with 7 points and thus was already normalized. Therefore we implemented the three remaining steps in order to test the measurement properties of the formative constructs of our model. We also added three items that were not in the main model in order to see whether the relevant values held together better than with items that were not in the nomological model. These items were time spent by individuals to read online papers, to read and post message to newsgroups, and to make purchases on the web. The result of this procedure was the matrix shown in Table A2. The rectangles highlighted in this table correspond to the three formative constructs and suggest areas of focus for determining construct validity.

The analysis of the matrix shows that all weighted indicators load significantly on their intended composite indicator at a level of $p<0.01$. We can therefore conclude that the instrument has appropriate convergent validity.

Discriminant validity can be established when the indicators correlate more highly with each other and with their intended construct than with other measures and/or constructs. We hence compared the values of the rectangle of Institution-based Trust and Trusting Beliefs in the IT Artifact with the values of items in their rows and columns as suggested by Loch et al. (2003a). We found one exception to this principle, for the Institution-based Trust construct. In particular, the correlation between INSGEN and IBT (-0.197, $p<0.01$) is smaller than the correlation of TRUST measures with IBT (from -0.221, $p<0.01$ to 0.311, $p<0.01$).

Apart from this exception, the matrix provided evidences of appropriate discriminant validity. Furthermore, as argued in previous studies some non-meaningful exceptions may appear in a large matrix because of chance (Campbell et al. 1959; Loch et al. 2003a). Given the size of our matrix and the large number of items in the Institution-based Trust construct, the violations are within a reasonable level. We can thus conclude that our instrument has appropriate discriminant validity.

Another technique to assess the measurement properties of an instrument is to test multicollinearity among indicators. Low levels of multicollinearity among indicators can usually be assessed by levels of variance inflation factor (VIF) lower than 10 [22]. Our analysis showed that our constructs had all values under this threshold.

Table A1. Structural Model Results

	Standardized path coefficient (Direct effect)	T-Statistics	Indirect effect	Total effect
IBT → TRUST	0.18	3.55	0.00	0.18
PEOU → TRUST	0.33	4.10	0.00	0.33
TRUST → IU	0.49	9.67	0.00	0.49
WEBGRA → PEOU	0.37	5.78	0.00	0.37
WEBGRA → TRUST	0.21	2.11	0.12	0.33
WEBNAV → PEOU	0.37	5.19	0.00	0.37
WEBNAV → TRUST	0.29	2.87	0.12	0.41
CULTURE → TRUST	0.47	2.32	0.00	0.47
XWEBGRA → TRUST	0.20	0.95	0.00	0.20
XWEBNAV → TRUST	-0.61	2.34	0.00	-0.61

*Total effect= direct effect + indirect effect

Table A2: Modified Multitrait Multimethod Matrix

	AB	BEN	INT	TRUST	INSAB	INSGEN	INSST	INSBEN	INSINT	IBT	READ	NEWS	PROD	SHOP
AB	1													
BEN	.560**	1												
INT	-.361**	-.434**	1											
TRUST	.958**	.771**	-.392**	1										
INSAB	.222**	.236**	-.196**	.247**	1									
INSGEN	-0.092	-0.052	0.091	-0.086	-.502**	1								
INSST	.261**	.165**	-.164**	.254**	.558**	-.564**	1							
INSBEN	.134*	.204**	-.156*	.170**	.621**	-.441**	.451**	1						
INSINT	.204**	.243**	-.227**	.235**	.733**	-.645**	.637**	.595**	1					
IBT	.289**	.270**	-.221**	.311**	.742**	-.197**	.802**	.516**	.707**	1				
READ	0.012	0.122	-0.108	0.048	0.043	-0.049	-0.041	-0.032	0.058	-0.022	1			
NEWS	0.006	0.087	-0.077	0.032	-0.062	.130*	-0.098	-0.015	-0.025	-0.018	.544**	1		
PROD	-0.003	0.064	-.151*	0.014	0.057	-0.043	-0.007	0.055	.133*	0.042	.547**	.445**	1	
SHOP	0.032	0.09	-.172**	0.05	0.074	-0.094	0.051	0.058	.134*	0.056	.567**	.473**	.807**	1

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Legend

AB—Trusting Beliefs-Ability	BEN—Trusting Beliefs-Benevolence	INT—Trusting Beliefs-Integrity	TRUST—Trusting Beliefs
INSAB—Institution-based Trust (Situation Normality—Ability)	INSGEN—Institution-based trust (Situation Normality—General)	INSST—Institution-based trust (Structural assurance)	INSBEN—Institution-based trust (Situation Normality—Benevolence)
INSINT—Institution-based Trust (Situation Normality—Integrity)	IBT—Institution-based Trust	READ—Time spent reading online newspapers	NEWS—Time spent reading or posting messages to newsgroups
PROD—Time spent accessing information on the Web about products and services		SHOP—Time spent shopping (i.e., actually purchasing something) on the Web	

Appendix 2B: Descriptive Statistics, Modified MTMM, and Instrumentation

Table B1: Descriptive Statistics for Subsamples

		USA (N=135)		France (N=116)	
		Mean	**Std. Dev**	**Mean**	**Std. Dev**
Institution-based trust	INSGEN1	5.6	0.9	4.7	1.4
	INSGEN2	6.0	1.1	4.7	1.6
	INSBEN1	4.9	1.3	5.6	1.3
	INSBEN2	4.5	1.2	3.6	1.1
	INSBEN3	4.1	1.3	3.5	1.0
	INSINT1	5.0	1.2	4.1	1.2
	INSINT2	5.4	1.0	4.5	1.1
	INSINT3	4.9	1.3	4.2	1.0
	INSAB1	5.1	1.0	4.3	1.1
	INSAB2	5.3	1.0	4.3	1.0
	INSAB3	5.1	1.0	4.4	0.9
	INSST1	4.9	1.4	4.4	1.3
	INSST2	4.4	1.6	4.5	1.4
	INSST3	5.0	1.4	4.6	1.4
	INSST4	4.8	1.4	4.8	1.3
Trust	AB1	4.5	1.4	4.7	1.3
	AB2	4.8	1.3	4.9	1.2
	AB3	4.6	1.3	5.0	1.1
	AB4	4.8	1.3	4.5	1.2
	BEN1	4.2	1.2	4.0	1.2
	BEN2	4.3	1.2	4.0	1.2
	BEN3	4.2	1.3	4.1	1.4
	INT1	4.1	1.4	3.8	1.5
Intention	INTENT1	3.6	1.5	3.3	1.6
	INTENT2	3.7	1.7	3.1	1.6
	INTENT3	3.8	1.6	3.4	1.6
Visual Appeal	WEBGRA1	4.2	1.5	4.0	1.5
	WEBGRA2	4.4	1.4	4.1	1.5
	WEBGRA3	4.4	1.4	4.0	1.6
Navigation Structure	WEBNAV1	4.2	1.3	4.2	1.3
	WEBNAV2	3.8	1.4	3.9	1.4
	WEBNAV3	4.7	1.3	4.7	1.3
Others	READ	2.8	1.7	2.1	1.3
	NEWS	1.9	1.5	1.9	1.3
	SHOP	2.5	1.6	2.0	1.2
	AGE	31.6	6.5	22.8	4.1
	YRSCOL	6.3	2.3	4.4	1.1
	PROD	3.2	1.8	2.3	1.4

Table B2: Survey Instrument Items

Construct	Subconstruct	Code	Items	Author
			Scale : 1- Strongly disagree … 7- Strongly agree	
Institution-based trust	Situational normality-general (IG)	INSGEN1	I feel good about how things go when I do purchasing or other activities on the Internet.	McKnight et al. 2002
		INSGEN2	I am comfortable making purchases on the Internet.	
	Situational normality-benevolence (IB)	INSBEN1	I feel that most Internet vendors would act in a customers' best interest.	
		INSBEN2	If a customer required help, most Internet vendors would do their best to help.	
		INSBEN3	Most Internet vendors are interested in customer well-being, not just their own well-being.	
	Situational normality-Integrity (II)	INSINT1	I am comfortable relying on Internet vendors to meet their obligations.	
		INSINT2	I feel fine doing business on the Internet since Internet vendors generally fulfill their agreements.	
		INSINT3	I always feel confident that I can rely on Internet vendors to do their part when I interact with them.	
	Situational normality-Competence (IC)	INSAB1	In general, most Internet vendors are competent at serving their customers.	
		INSAB2	Most Internet vendors do a capable job at meeting customer needs.	
		INSAB3	I feel that most Internet vendors are good at what they do.	
	Structural assurance (ISA)	INSST1	The Internet has enough safeguards to make me feel comfortable using it to transact personal business.	
		INSST2	I feel assured that legal and technological structures adequately protect me from problems on the Internet.	
		INSST3	I feel confident that encryption and other technological advances on the Internet make it safe for me to do business there.	
		INSST4	In general, the Internet is now a robust and safe environment in which to transact business.	
Trusting Beliefs in the IT artifact	Trusting Beliefs—Competence	AB1	This mobile website is competent and effective in facilitating browsing.	McKnight et al. 2002
		AB2	This mobile website is competent and effective in facilitating purchasing.	
		AB3	This mobile website performs its role of facilitating mobile commerce very well.	
		AB4	Overall, this mobile website is a capable and proficient mobile commerce facilitator.	
	Trusting Beliefs—Benevolence	BEN1	This mobile website puts my interests first.	Wang and Benbasat (2005b)
		BEN2	This mobile website keeps my interests in mind.	
		BEN3	This mobile website wants to understand my needs and preferences.	
	Trusting Beliefs—Integrity	INT1	This mobile website provides unbiased product recommendations.	
Perceived Ease of Use	Ease of Use Perceptions	PEOU1	My interaction with the mobile web site is clear and understandable.	Wang and Benbasat (2005b)
		PEOU3	Learning to use the mobile web site was easy.	
		PEOU5	Overall, I found that the mobile web site is easy to use.	
Intention to Use	Intention to adopt	INTENT1	I am willing to use this mobile website as an aid to help with my decisions about which product to buy.	Wang and Benbasat (2005b)
		INTENT2	I am willing to let this mobile website assist me in deciding which product to buy.	
		INTENT3	I am willing to use this mobile website as a tool that suggests to me a number of products from which I can choose.	
Visual Appeal	Visual Appeal perceptions	WEBGRA1	I like the look and feel of the mobile website.	Montoya-weiss et al. (2003)
		WEBGRA2	The mobile website is attractive	
		WEBGRA3	I like the graphics on the mobile website	
Navigation Structure	Navigation Structure perceptions	WEBNAV1	It is easy to find what I am looking for on the mobile website.	Montoya-weiss et al. (2003)
		WEBNAV2	It is easy to move around online using the mobile website.	
		WEBNAV3	The mobile website offers a logical layout that is easy to follow.	

Table B3: Factor Loadings and Cross-Loadings

Constructs	Item	1	2	3	4	5	6	7	8	9	10	11
1. Trust in the IT artifact-Competence	AB1	**0.85**	0.53	0.10	0.09	0.01	0.15	0.17	0.42	0.52	0.47	0.43
	AB2	**0.89**	0.52	0.19	0.12	0.07	0.18	0.23	0.40	0.62	0.49	0.45
	AB3	**0.89**	0.49	0.14	0.11	0.10	0.12	0.22	0.34	0.52	0.41	0.44
	AB4	**0.89**	0.58	0.32	0.14	0.13	0.24	0.28	0.43	0.61	0.50	0.44
2. Trust in the IT artifact-Benevolence	BEN1	0.56	**0.89**	0.23	0.20	0.08	0.25	0.22	0.43	0.41	0.41	0.39
	BEN2	0.54	**0.90**	0.23	0.22	0.07	0.25	0.15	0.49	0.42	0.43	0.36
	BEN3	0.40	**0.72**	0.14	0.09	-0.01	0.13	0.04	0.29	0.30	0.26	0.28
3. Institution-based trust—situational normality-Competence	INSAB1	0.19	0.19	**0.88**	0.63	0.43	0.63	0.48	0.21	0.28	0.15	0.08
	INSAB2	0.24	0.28	**0.92**	0.57	0.46	0.69	0.49	0.24	0.27	0.19	0.09
	INSAB3	0.16	0.19	**0.91**	0.53	0.48	0.67	0.56	0.25	0.27	0.16	0.15
4. Institution-based trust—situational normality-benevolence	INSBEN1	0.08	-0.02	0.25	**0.56**	0.27	0.25	0.32	0.00	0.08	-0.05	0.12
	INSBEN2	0.08	0.19	0.59	**0.86**	0.43	0.55	0.38	0.21	0.10	0.15	0.05
	INSBEN3	0.15	0.25	0.55	**0.84**	0.30	0.51	0.34	0.27	0.12	0.12	0.12
5. Institution-based trust—situational normality-general	INSGEN1	0.07	0.04	0.47	0.39	**0.95**	0.61	0.53	0.07	0.17	0.12	0.04
	INSGEN2	0.09	0.08	0.49	0.45	**0.95**	0.61	0.53	0.06	0.19	0.11	0.08
6. Institution-based trust—situational normality-Integrity	INSINT1	0.17	0.25	0.64	0.56	0.56	**0.88**	0.55	0.19	0.28	0.23	0.16
	INSINT2	0.17	0.20	0.65	0.51	0.65	**0.91**	0.61	0.19	0.34	0.19	0.16
	INSINT3	0.18	0.22	0.61	0.48	0.46	**0.80**	0.51	0.27	0.25	0.23	0.10
7. Institution-based trust—Structural assurance	INSST1	0.18	0.16	0.53	0.42	0.51	0.59	**0.83**	0.10	0.19	0.12	0.11
	INSST2	0.24	0.15	0.42	0.36	0.35	0.44	**0.84**	0.16	0.11	0.05	0.13
	INSST3	0.25	0.18	0.51	0.36	0.58	0.60	**0.88**	0.11	0.21	0.09	0.07
	INSST4	0.23	0.11	0.48	0.40	0.46	0.57	**0.90**	0.13	0.22	0.06	0.15
8. Intention to Use	INTENT1	0.42	0.43	0.22	0.20	0.07	0.19	0.14	**0.90**	0.46	0.52	0.46
	INTENT2	0.41	0.45	0.29	0.23	0.13	0.28	0.15	**0.95**	0.45	0.55	0.42
	INTENT3	0.42	0.45	0.19	0.20	0.00	0.21	0.11	**0.90**	0.41	0.54	0.41
9. Perceived Ease of Use	PEOU1	0.52	0.39	0.29	0.15	0.21	0.30	0.16	0.36	**0.81**	0.47	0.47
	PEOU2	0.52	0.45	0.26	0.07	0.17	0.24	0.18	0.47	**0.78**	0.47	0.57
	PEOU3	0.50	0.25	0.24	0.08	0.15	0.29	0.14	0.28	**0.82**	0.46	0.48
	PEOU4	0.49	0.34	0.22	0.13	0.09	0.24	0.20	0.44	**0.73**	0.32	0.52
	PEOU5	0.57	0.36	0.22	0.11	0.14	0.28	0.18	0.37	**0.87**	0.48	0.54
10. Visual Appeal	WEBGRA1	0.54	0.43	0.19	0.13	0.12	0.26	0.11	0.54	0.56	**0.92**	0.56
	WEBGRA2	0.47	0.42	0.16	0.09	0.11	0.20	0.07	0.57	0.52	**0.93**	0.54
	WEBGRA3	0.44	0.36	0.17	0.11	0.10	0.21	0.07	0.49	0.41	**0.89**	0.44
11. Navigation Structure	WEBNAV1	0.44	0.37	0.12	0.09	0.05	0.15	0.15	0.43	0.62	0.42	**0.89**
	WEBNAV2	0.43	0.36	0.11	0.13	-0.01	0.10	0.09	0.51	0.48	0.54	**0.85**
	WEBNAV3	0.43	0.35	0.09	0.10	0.11	0.17	0.09	0.30	0.59	0.53	**0.87**

N.B. Values larger than 0.50 in our Average Variance Extracted (AVE) matrix (Chin 1998d) indicate convergent validity. Furthermore, the square root of the AVE should be larger for an intended construct than correlations with unintended constructs (Diamantopoulos et al. 2001b), yielding proof of discriminant validity. Moreover, values in the AVE diagonal should be larger than values outside the diagonal. Therefore, relying on evaluations of factorial validity and AVEs, we can conclude that the reflective indicators of our model show both convergent and discriminant validity.

Table B5. Model Loadings, T-Statistics & Average Variance Extracted (AVE) for Reflective Indicators

Construct	Item	Original Sample	Sample Mean	Standard Deviation	Standard Error	T Statistics	AVE
1. Trust in the IT artifact-Competence	AB1	0.84	0.84	0.02	0.02	35.03	0.76
	AB2	0.88	0.88	0.02	0.02	46.40	
	AB3	0.89	0.88	0.02	0.02	45.08	
	AB4	0.88	0.88	0.02	0.02	49.32	
2. Trust in the IT artifact-Benevolence	BEN1	0.89	0.89	0.01	0.01	63.88	0.69
	BEN2	0.88	0.88	0.02	0.02	39.57	
	BEN3	0.72	0.71	0.05	0.05	14.02	
3. Institution-based Trust—situational normality-Competence	INSAB1	0.88	0.88	0.02	0.02	47.13	0.82
	INSAB2	0.93	0.93	0.01	0.01	81.48	
	INSAB3	0.91	0.91	0.01	0.01	72.96	
4. Institution-based trust—situational normality-benevolence	INSBEN1	0.56	0.56	0.07	0.07	7.53	0.58
	INSBEN2	0.85	0.85	0.02	0.02	41.30	
	INSBEN3	0.84	0.84	0.03	0.03	28.16	
5. Institution-based Trust—situational normality-general	INSGEN1	0.95	0.95	0.01	0.01	110.48	0.90
	INSGEN2	0.95	0.95	0.01	0.01	94.09	
6. Institution-based Trust—situational normality-Integrity	INSINT1	0.88	0.88	0.02	0.02	49.27	0.75
	INSINT2	0.91	0.91	0.01	0.01	72.07	
	INSINT3	0.81	0.81	0.03	0.03	29.00	
7. Institution-based Trust—Structural Assurance	INSST1	0.83	0.83	0.02	0.02	33.46	0.75
	INSST2	0.84	0.84	0.03	0.03	26.76	
	INSST3	0.88	0.88	0.02	0.02	49.38	
	INSST4	0.90	0.90	0.01	0.01	66.29	
8. Intention to Use	INTENT1	0.89	0.89	0.02	0.02	41.58	0.83
	INTENT2	0.95	0.95	0.01	0.01	123.86	
	INTENT3	0.89	0.89	0.02	0.02	49.38	
9. Perceived Ease of Use	PEOU1	0.80	0.80	0.03	0.03	31.46	0.63
	PEOU2	0.77	0.77	0.03	0.03	22.07	
	PEOU3	0.81	0.80	0.03	0.03	24.74	
	PEOU4	0.71	0.71	0.06	0.06	12.83	
	PEOU5	0.86	0.86	0.03	0.03	33.04	
10. Visual Appeal	WEBGRA1	0.92	0.92	0.01	0.01	76.52	0.83
	WEBGRA2	0.92	0.92	0.02	0.02	55.32	
	WEBGRA3	0.89	0.89	0.02	0.02	37.07	
11. Navigation Structure	WEBNAV1	0.88	0.89	0.01	0.01	61.76	0.75
	WEBNAV2	0.84	0.84	0.03	0.03	28.65	
	WEBNAV3	0.88	0.87	0.02	0.02	41.53	

N.B. To further test reflective measurement properties, we ran a PLS bootstrap with N=200 resampling (Gefen et al. 2005c). The above table provides the loadings, t-statistics and average variance extracted (AVE) for the independent variables. The loadings represent the strength of the ties between items and their construct. For reflective indicators, convergent validity can be assessed when items load significantly on their latent construct. The level of significance for t-values in the outer model loadings is reached when t >1.96. As can be seen from this table, all t-statistics are well above the 1.96 threshold for all three reflective constructs and are thus significant at the .05 alpha protection level. All the reflective items load highly on their own construct and at significant levels. Therefore we can conclude that the reflective constructs employed in this study demonstrate convergent validity.

Values larger than 0.50 in our Average Variance Extracted (AVE) matrix (Chin 1998d) indicate convergent validity. Furthermore, the square root of the AVE should be larger for an intended construct than correlations with unintended constructs (Diamantopoulos et al. 2001b), yielding proof of discriminant validity. Moreover, values in the AVE diagonal should be larger than values outside the diagonal. Therefore, relying on evaluations of factorial validity and AVEs, we can conclude that the reflective indicators of our model show both convergent and discriminant validity.

Table B6. AVE Statistics

Construct	CR	CA	1	2	3	4	5	6	7	8	9	10	11
1. AB	0.93	0.90	**0.87**										
2. BEN	0.87	0.77	0.10	**0.83**									
3. INSAB	0.93	0.89	0.01	0.10	**0.91**								
4. INSGEN	0.95	0.89	0.09	-0.05	-0.04	**0.95**							
5. INSST	0.92	0.89	0.02	0.09	1.00	-0.03	**0.87**						
6. ISBEN	0.80	0.63	0.00	0.17	0.48	0.15	0.48	**0.76**					
7. ISINT	0.90	0.83	-0.02	0.18	0.70	0.02	0.70	0.88	**0.87**				
8. IU	0.94	0.90	0.42	0.09	0.03	0.08	0.03	0.11	0.06	**0.91**			
9. EOU	0.89	0.85	0.57	0.08	-0.02	0.22	-0.03	0.04	0.04	0.45	**0.79**		
10. WEBGRA	0.93	0.90	0.51	0.11	0.08	0.11	0.08	0.13	0.14	0.57	0.55	**0.91**	
11. WEBNAV	0.90	0.83	0.48	0.03	-0.02	0.05	-0.02	-0.10	-0.11	0.49	0.55	0.50	**0.87**

Appendix 2C. Application of Carte and Russell Moderation Tests

Table C1. Carte and Russell's Moderation Guidelines and their Application to the Current Study

Error	Solution	Application to Current Study
1. Interpreting b_3 instead of ΔR^2	Use ΔR^2 as the index of moderator effect size after establishing statistical significance using either a t-test of H0: b3 = 0 or H0: $\Delta R^2 = 0$	As recommended, we used ΔR^2 as the index of moderator effect size. Applying the F-test formula proposed by Carte and Russell (Carte et al. 2003, p. 481), we found that the significance of ΔR^2 for the moderation of Visual Appeal → Trust was insignificant, as expected (since the effect of Visual Appeal on Trust was insignificant). However, the ΔR^2 for the moderation of Navigation Structure → Trust was also insignificant. To verify this result, we ran a pseudo F-test proposed by Mathieson et al. (2001) which is designed to test the change in R^2 of the moderation effect size in PLS and consists of comparing models with and without the moderation (Burton-Jones et al. 2006b). Effect sizes (f^2) are calculated as $(R^2_{Model\ 1}-R^2_{Model2})/(1- R^2_{Model2})$ (Chin et al. 2003b; Mathieson et al. 2001). Multiplying f^2 by (n-k-1), where n is the sample size and k is the number of independent variables, yields a pseudo-F test for the change in R^2 with 1 and n - k degrees of freedom (Mathieson et al. 2001). Applying the pseudo F-test, we found that the ΔR^2 for the moderation of Navigation Structure → Trust is significant ($F=7.90$, $p < .005$), though the effect size is small at .03 (Cohen 1988b). Thus, we conclude that the moderation effect of culture on the relationship between Navigation Structure and Trust is significant, although the effect size is small. These results are acceptable given the exploratory nature of this theorized interaction.

Error	Solution	Application to Current Study
2. Interpreting b_1 and b_2 When X and Z are interval scale measures	Develop ratio scale measures of X and Z or do not use or develop models requiring interpretation of b_1 and b_2.	The moderating variable in our study—Culture—was captured as nominal data (with possible values 0 or 1). Therefore, although we theorize a moderating and a main effect, this guideline regarding interval data does not apply.
3. Confounding of X*Z with X^2	Partial out X^2 effects by adding X^2 term to MMR analyses.	This guideline refers to the possibility of the moderating variable being too similar to the independent variable, potentially leading to a nonlinear or quadratic effect, rather than a moderated effect. In our study, the moderating variable Culture is conceptually quite different from either Navigation Structure and Visual Appeal, the moderated independent variables. We therefore did not attempt to partial out quadratic effects from the model.
4. Incorrect specification of the X→Y versus → X causal sequence	1. Careful consideration of theory or rationale justifying causal sequence to ensure correct sequence is selected. 2. Examine the moderation effects in both causal sequences as part of exploratory effort that might lead to theory development.	Independent variables with moderated effects in our model are system quality characteristics Navigation Structure and Visual Appeal. The endogenous variable they affect is Trusting Beliefs in the IT Artifact. Manifestly, trusting beliefs alone cannot directly affect system quality characteristics. A reverse causal connection is not really feasible. Consequently, no further analysis on this point was performed.
5. Low power of random effects designs	Solution: 1. Estimate sample size required to reject H0: $\Delta R^2 = 0$ with X, Z combinations that are expected to be observed in the data. 2. Take extra care before "trimming" any outliers.	This guideline applies chiefly to “survey research where investigators measure independent variables using survey instruments” (Carte et al. 2003, p. 487). Our study employed an experiment with a fixed effect, viz., Culture. For this reason, the problems of statistical power described in this guideline do not apply. Even if they did apply, our statistical power is reasonable, given the decent sample size.

Error	Solution	Application to Current Study
6. Dependent variable scale is too coarse	Investigate number of levels of X and Z expected and select method of operationalizing Y that meets or exceeds their product.	This guideline refers to the scenario of a survey or experimental participant reporting values for both the independent and moderating variables. In our case however, the moderating variable is a function of the experimental group the participant belongs to (US or France, i.e., 0 or 1) and is not a self-reported value. Therefore, this criterion does not seem to apply. Even if it did, the possible values for the moderation are 8 and that of the DV is 7. These are very close and thus the DV is likely not too coarse.
7. Nonlinear, monotonic Y transformations	Do no transformations without a theoretical rationale. Bootstrap estimates of confidence interval around ΔR^2 if parametric assumptions are not met.	This guideline also applies to studies using a random effects design. Our design called for an experiment with a fixed effect, namely Culture. Therefore, this guideline does not directly apply. Regardless, we tested for homoscedasticity and found that our data do not violate any parametric assumptions.
8. Influence of measurement error on X*Z	First, estimate expected ΔR^2 by simulating X*Z interaction and adjusting obtained ΔR^2 for measurement error in X and Z. Second, estimate sample size required to reject H0: $\Delta R^2 = 0$ when the expected MMR effect size is the adjusted estimate of ΔR^2.	The psychometric properties of the instrument are acceptable and so measurement error is low. Thus, measurement error for the moderation is also low. For measurement error for the independent variables, we performed several tests for measurement error which are described in the appendices. Given the affirmative results of these tests, we conclude that measurement error did not impact the X*Z moderation.

Error	Solution	Application to Current Study
9. Gamma differences between two groups in PLS	Test for differences between Inter-item correlation matrices between two groups using Hotelling T^2 and/or assess factor loading similarities using coefficient of concordance (Harman 1976). If no differences exist, scales derived from the items must be arrived at in the same way for all observations. If differences exist, explore for possible differences in latent construct domain tapped by items.	This issue arises when moderation is tested by using PLS to compare the path coefficients in two sub-groups. In contrast, our method tested moderation by incorporating Culture as a construct in the model. In addition, two interactions terms, NAV*Culture and GRA*Culture, were also added to the model. These interaction terms were calculated by multiplying the indicator values for NAV and GRA by the Culture dummy variable. These interaction terms were then connected to the Trust construct in the model. Moderation was then tested by assessing the significance of the path coefficients leading from this interaction constructs to the Trust construct.

Appendix 2D. Description of Common Methods Bias Tests

To test for common methods bias we performed the technique described in “Controlling for the effects of a single unmeasured latent method factor” (Podsakoff et al. 2003a, p. 894). While this kind of test is generally applied with covariance-based SEM approaches such as LISREL, some have adapted this technique to be implementable via PLS (Liang et al. 2007). As recognized by these authors, PLS allows items to load only on one construct. Further, PLS does not provide random error statistics. To adapt Podsakoff’s common methods bias technique, researchers using PLS must first convert individual items into single indicator constructs. Consistent with prior research, the resulting path analysis should be equivalent to a factor loading (Marcoulides et al. 2002). This conversion allows the common method variance factor to be assigned to all individual items. Second, we then linked the original constructs to the single indicator constructs. The paths were from the original latent variable to the single indicator construct modelling thus reflective constructs. Third, we linked the common methods variance factor to all single indicator constructs (from CMV factor to individual indicator constructs). Finally, we ran the PLS bootstrap with 200 resamples. According to Liang et al.:

> For each single-indicator construct […], we examined the coefficients of its two incoming paths from its substantive construct and the method factor. These two path coefficients are equivalent to the observed indicator’s loadings on its substantive construct and the method factor and can be used to assess the presence of common method bias. […]The squared values of the method factor loadings were interpreted as the percent of indicator variance caused by method, whereas the squared loadings of substantive constructs were interpreted as the percent of indicator variance caused by substantive constructs. If the method factor loadings are insignificant and the

indicators’ substantive variances are substantially greater than their method variances, we can conclude that common method bias is unlikely to be a serious concern (2007).

The results for the analyses are shown in Table D1. Of the 23 paths from CMV to single indicator constructs, 7 were significant, indicating a small amount of common methods variance.

Table D1. Common Methods Bias Path Coefficients

	Paths/Loadings	**Original Sample (O)**	**Squared Factor Loadings (R^2)**	**T-statistic (|O/STERR|)**
Common Methods Variance (CMV) Factor loadings	CMV → AB	0.01	0.12	0.56
	CMV → BEN	-0.02	0.14	0.70
	CMV → INT	-0.08	0.28	**1.96**
	CMV → CULT	0.00	0.00	0.00
	CMV → INSAB	0.08	0.27	1.76
	CMV → INSBEN	-0.03	0.16	0.51
	CMV → INSGEN	-0.08	0.28	1.35
	CMV → INSINT	0.08	0.28	2.24
	CMV → INSST	-0.07	0.27	1.45
	CMV → IU1	-0.01	0.11	0.26
	CMV → IU2	0.00	0.04	0.04
	CMV → IU3	0.01	0.11	0.23
	CMV → PEOU1	0.22	0.46	**2.04**
	CMV → PEOU2	0.31	0.56	**3.80**
	CMV → PEOU3	0.11	0.34	0.60
	CMV → PEOU4	-0.49	0.70	1.83
	CMV → PEOU5	-0.50	0.71	**2.35**
	CMV → WBGRA1	0.08	0.28	1.47
	CMV → WBGRA2	0.04	0.21	1.04
	CMV → WBGRA3	-0.13	0.36	**2.43**
	CMV → WBNAV1	0.00	0.04	0.03
	CMV → WBNAV2	0.05	0.22	0.91
	CMV → WBNAV3	-0.17	0.41	2.02
Substantive constructs factor loadings	IU → IU1	0.90	0.95	21.63
	IU → IU2	0.95	0.97	35.68
	IU → IU3	0.88	0.94	19.95
	INSTITU → INSAB	0.81	0.90	30.42
	INSTITU → INSBEN	0.77	0.88	22.47
	INSTITU → INSGEN	0.80	0.89	23.98
	INSTITU → INSINT	0.86	0.93	38.37
	INSTITU → INSST	0.83	0.91	23.97
	PEOU → PEOU1	0.62	0.79	6.63
	PEOU → PEOU2	0.55	0.74	5.74
	PEOU → PEOU3	0.62	0.79	2.95

	PEOU → PEOU4	0.92	0.96	7.17
	PEOU → PEOU5	0.96	0.98	16.87
	TRUST → AB	0.91	0.95	27.20
	TRUST → BEN	0.86	0.93	36.51
	TRUST → INT	0.11	0.34	0.35
	WEBGRA → WBGRA1	0.85	0.92	18.37
	WEBGRA → WBGRA2	0.88	0.94	21.17
	WEBGRA → WBGRA3	1.00	1.00	25.38
	WEBNAV → WBNAV1	0.89	0.94	22.68
	WEBNAV → WBNAV2	0.85	0.92	18.57
	WEBNAV → WBNAV3	0.38	0.61	1.34
	CULTURE → CULT	1.00	1.00	0.00
Path coefficients	CULTURE → TRUST	0.10	0.31	1.90
	INSTITU → TRUST	0.14	0.38	2.46
	PEOU → TRUST	0.27	0.52	3.02
	TRUST → IU	0.50	0.71	10.76
	WEBGRA → PEOU	0.32	0.56	4.72
	WEBGRA → TRUST	0.30	0.55	4.27
	WEBNAV → PEOU	0.35	0.59	4.84
	WEBNAV → TRUST	0.18	0.43	2.06

In order to further analyze common method bias, we also conducted Harman's single factor test (Podsakoff et al. 2003a). We ran an exploratory factor analysis in which we included all first order constructs of the model and then examined the unrotated factor solution. The first factor explained 30.47 percent of the variance, indicating that common methods bias is not substantial in our analyses. Indeed, Podsakoff et al. point out that if there is a significant level of common method bias, "(a) a single factor will emerge from the factor analysis or (b) one general factor will account for the majority of the covariance among the measures" (2003a, p. 889). Since more than one factor emerged to explain the variance in our analysis, we can conclude that according to that test common methods bias in this case is not significant.

Finally, the correlation matrix (See Table 6. AVE statistics) shows moderate correlation among factors, indicating that factors measure different constructs. Indeed, the highest correlation was .57, while, according to previous studies, high correlations providing evidence of common methods variance would be above .90 (Pavlou et al. 2007b). Therefore, while the first test detected a small amount of common method bias, two subsequent tests showed that common methods bias does not significantly affect our analyses.

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Appendix 3A. Instrument Items

Construct	Code	Items	Citation
Risk beliefs (reflective construct)	**RISK1**	In general, it would be risky to give the forecast information to others.	Original from (Jarvenpaa et al. 1999) improved by (Malhotra et al. 2004b)
	RISK2	There would be a high potential for loss associated with giving the forecast information to others.	
	RISK3	Providing others with the forecast information would involve many unexpected problems.	
	RISK4*(d)	I would feel safe giving the forecast information to online companies.	
Trust in Information Sharing Tool (reflective construct)		Please evaluate the quality of information from the TQN system:	(Grazioli et al. 2000b)
	TQN1	Accurate	
	TQN2*	Misleading	
	TQN3	Truthful	
	TQN4*	Deceptive	
	TQN5	Factual	
	TQN6*(d)	Distorted	
Anonymizing Beliefs (reflective)	**ANYN1*(d)**	To what extent do you think you are anonymous while using the system?	(Qian et al. 2007)
	ANYN2*	I believed others could identify my inputs	(Pinsonneault et al. 1996)
	ANYN3(d)	I believed that group members did not know each other well enough to identify the inputs.	
	ANYN4(d)	I believed the group was large enough that it was impossible for any one to identify my inputs.	
	ANYN5*	I believed the system could malfunction and identify my input.	
	ANYN6*(d)	I believed it was possible to identify my input using the system.	
	ANYN7*	I believed that the system attached a code to inputs so that they could be identified if needed.	
	ANYN8(d)	I believed that no names were attached to inputs by the system.	
System Quality (formative)	**QUAL1**	This information sharing tool keeps my interests in mind.	(Wang et al. 2005)
	QUAL2	Using this information sharing tool allowed me to accomplish more analysis than would otherwise have been possible.	
	QUAL3	Using this information sharing tool greatly enhanced the quality of my judgments.	
	QUAL4	Learning to use the information sharing tool was easy.	
	QUAL5(d)	Overall, I found that the information sharing tool is easy to use.	
	QUAL6	I like the look and feel of the information sharing tool.	(Montoya-Weiss et al. 2003)
	QUAL7	The information sharing tool provides reliable service.	(Wang et al. 2005)
	QUAL8	I find the information sharing tool easy to use.	

* Item reversed. (d) Dropped for improved reliability and/or measurement validity.

Appendix 3B. Validation of Reflective Constructs

To test construct validity and reliability for reflective constructs in model, procedures for PLS validation outlined by Gefen and Straub were followed (2005b). To test convergent validity, a bootstrap with 400 resamples was performed and the resulting t-values of the outer model loadings were then examined. Convergent validity is demonstrated when all indicators load significantly on their respective latent construct. In the initial bootstrap, items that did not load significantly on their indented construct were dropped from the analysis to improve convergent validity. Once these items were dropped, a bootstrap was again performed. In this second analysis, all indicators exhibited loadings that were significant at least at the .01 level (see Table B1), denoting strong convergent validity. An additional test of convergent validity put forward by Fornell and Larcker (Fornell et al. 1981b) is that of the average variance extracted (AVE), a measure of variance explained by a latent construct for the variance observed in its measurement items, should be at least .50 or higher. The reflective construct AVE values are also shown in Table B1. The results of both tests indicate a high degree of convergent validity[11].

Table B1. T-statistics for Convergent Validity

Construct	Construct	T-Value	AVE
Anonymity	ANYN2R	3.93***	0.55
	ANYN5R	3.83***	
	ANYN7R	2.88**	
Risk	RISK1	5.60***	0.74
	RISK2	3.69***	
	RISK3	5.07***	
Trust	TQN1	18.22***	0.54
	TQN2R	5.21***	
	TQN3	10.12***	
	TQN5	11.02***	
	TQN6R	10.56***	

** p < .01; *** p < .005

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[11] N.B. These convergent validity tests were not performed for the dependent variable, *IT adoption*, because these tests are not applicable for single-item constructs.

To evaluate discriminant validity, two tests were performed. First, the cross loadings of measurement items on latent constructs were examined. In this test, discriminant validity is demonstrated when an item more highly loads on its intended construct than on any other construct. Following Gefen and Straub (Gefen et al. 2005b), this difference in loadings should be at least .10. In this test, all items showed excellent discriminant validity (see Table B2).

Table B2. Cross Loadings of Measurement Items to Latent Constructs

Item	Anonymity	IT Adoption	Risk	System Quality	TQN Trust
ANYN2R	**0.76**	0.17	-0.36	-0.01	0.00
ANYN5R	**0.85**	0.22	-0.33	-0.08	-0.07
ANYN7R	**0.60**	0.13	-0.17	0.16	0.09
ITAdopt	0.24	**1.00**	-0.16	0.16	0.28
RISK1	-0.37	-0.15	**0.87**	0.09	0.11
RISK2	-0.30	-0.10	**0.83**	0.07	-0.07
RISK3	-0.34	-0.15	**0.88**	0.03	-0.10
TQN1	-0.15	0.24	0.16	0.52	**0.83**
TQN2R	0.13	0.23	-0.18	0.32	**0.60**
TQN3	-0.07	0.07	0.07	0.41	**0.77**
TQN5	-0.05	0.21	0.03	0.43	**0.77**
TQN6R	0.15	0.28	-0.21	0.37	**0.69**

A second test of discriminant validity is to compare the AVE score for each construct. In the AVE test of discriminant validity, the square root of a given construct's AVE should be larger than any correlation of the given construct with any other construct in the model (Chin 1998a). The results depicted in Table B3 again demonstrate strong discriminant validity.

Table B3. Calculation of Discriminant Validity through the Square Root of AVE

Construct	Anonymity	IT Adoption	Risk	TQN Trust
Anonymity	**0.74**			
IT Adoption	0.24	**1.00**		
Risk	-0.39	-0.16	**0.86**	
TQN Trust	-0.01	0.28	-0.02	**0.74**

Finally, to test the reliability of measurement items, SmartPLS was used to compute the Cronbach's α as well a composite reliability score (Fornell et al. 1981b) which is evaluated the same way as Cronbach's α. Both scores are reported in Table B4. All constructs exhibited a reliability score that met and in most cases exceed the .60 threshold accorded to exploratory research (Nunnally 1967) (Straub et al. 2004a).

Table B3. Reliability Scores

Construct	Cronbach's α	Composite Reliability
Anonymity	0.60	0.79
Risk	0.83	0.89
TQN Trust	0.79	0.86
N.B. IT Adoption is a single item measure; thus no reliability test was performed for this construct.		

In summary, the reflective constructs of the model displayed excellent convergent and discriminant validity as well as high item reliability meeting the high standards set for IS positivist research (Straub et al. 2004a).

Appendix 3C. Validation of Formative Construct

A series of validation tests were performed to evaluate the validity of the formative construct, System Quality. These validity tests were performed separately since validation techniques used to assess reflective constructs are not applicable to formative constructs (Petter et al. 2007b).

Content validity was assessed via a thorough literature review. Because comparatively little research in IS has examined system quality, a definitive set of dimensions that capture the construct has not yet been identified (Nelson et al. 2005). For this reason it was not possible to conclude on a set of items that exhaustively cover the dimensions of system quality identified in past research. Nevertheless, a high number of studies have measured system quality in terms of perceived usefulness, perceived ease of use, visual aesthetics of user interface elements, reliability, and accessibility (Montoya-Weiss et al. 2003; Nelson et al. 2005; Seddon 1997). Therefore, eight measurement items were selected to represent these dimensions. Given the representativeness of these items, sufficient content validity can be concluded.

Two methods were used to test construct validity. First, a confirmatory factor analysis was performed as part of the PLS algorithm calculation (Gefen et al. 2005b). For formative constructs, weights are evaluated, rather than loadings. The weights of the *system quality* items are summarized below in Table C1.

Table C1. Error term, T-statistic, and VIF scores for items

Item	Weight	Standard Error	T-Statistic	VIF-Initial	VIF-Recalculated
QUAL1	- .5112	0.1536	3.3271 ***	1.516	1.499
QUAL2	.2223	0.1472	1.5107	1.712	1.702
QUAL3	.7706	0.1857	4.1507 ***	2.001	1.972
QUAL4	.14	0.1187	1.1788	2.366	2.089
QUAL5	- .3531	0.1664	2.1223 **	3.622	Dropped
QUAL6	.2428	0.1754	1.3848	2.761	2.756
QUAL7	.2035	0.1228	1.6572 *	1.971	1.948
QUAL8	.156	0.1245	1.2532	3.243	2.265

* p < .10; ** p < .05; *** p < .025

As shown in Table C1 above, the weights of half of the items were significant. Although Diamantopoulos and Winklhofer (2001a) recommend removing items with insignificant weights, Bollen and Lennox (1991a) recommend that such be retained on the basis of theoretical grounds. Because substantial research supports the inclusion of each item, no items were removed from the measurement model.

Second, a multi-trait multi-method (MTMM) analysis was performed to assess convergent and discriminant validity (Loch et al. 2003a) (Vance et al. 2007). In this procedure, the items for each formative construct are multiplied by their respective weights, as calculated by PLS. Next, a composite measure is created for each formative construct by summing the weighted item values. Finally, a correlation matrix is calculated to determine the degree of correlation between items and their intended construct. Included in this correlation matrix are two demographical variables, age and years in college, which should not correlate with the weighted system quality items or the composite system quality value. The result of this analysis is summarized in Table C2.

Table C2. Inter-Item and Item-to-Construct Correlation Matrix

Item	1	2	3	4	5	6	7	8	9	10
QUAL1W (1)	1									
QUAL2W (2)	-.513**	1								
QUAL3W (3)	-.504**	.604**	1							
QUAL4W (4)	-.288**	.276**	.363**	1						
QUAL6W (5)	-.488**	.528**	.601**	.555**	1					
QUAL7W (6)	-.333**	.471**	.531**	.418**	.656**	1				
QUAL8W (7)	-.301**	.336**	.402**	.660**	.622**	.521**	1			
QUALSUM (8)	-.308**	.638**	.876**	.599**	.749**	.726**	.631**	1		
AGE (9)	0.079	-0.057	-0.064	-0.119	-0.145	-0.085	-0.065	-0.094	1	
SCHOOL (10)	-0.031	0.044	0.035	0.086	0.093	0.081	0.054	0.057	0.123	1

**. Correlation is significant at the 0.01 level (2-tailed).

The shaded area in Table C2 shows the inter-item and item-to-construct correlations for the *system quality* items and composite value. Convergent validity is demonstrated when weighted items belonging to a construct are significantly correlated with one another. Similarly, weighted items should correlate significantly with their associated composite construct value. The results in Table C2 show that both criteria are met, demonstrating convergent validity.

Discriminant validity is shown when weighted items within a construct correlate more highly with each other than with items not belonging to the construct. In Table C2 above, each system quality item and composite value is correlated by at least .20 higher than any correlation with an item outside of the system quality construct, evidencing strong discriminant validity. Thus, system quality demonstrates excellent construct validity.

Reliability was assessed in two ways. First, a variance inflation factor (VIF) analysis was performed to discern the amount of multicollinearity inherent in the formative construct (Petter et al. 2007b). The VIF analysis was performed in SPSS by regressing the IT adoption variable on the eight system quality items. The results of this first VIF analysis is summarized in Table C1 under the column “VIF Initial”. This analysis showed one item (QUAL5) with a VIF score above the 3.3 threshold suggested by Diamantopoulos and Siguaw (2006) and Diamantopoulos (2006). Petter et al. (2007b) recommend dropping items of formative constructs with VIF scores over the 3.3 threshold as long as removing the item does not diminish content validity (Diamantopoulos et al. 2001a). Further inspection of item Qual5 shows shared meaning with item Qual4 (Qual4: “Learning to use the information sharing tool was easy.”; Qual5: “Overall, I found that the information sharing tool is easy to use.”). Thus, elimination of Qual5 does not detract from the content of the system quality construct. A second VIF analysis was performed as before with Qual5 removed; the result of this test is shown in Table C1 in the column labeled “VIF-Recalculated”. In this later test, all VIF scores are below the recommended VIF threshold. Therefore, multicollinearity is not of concern for the system quality construct.

As an additional test of reliability, Diamantopoulos (2006) recommends examining the error term of the formative construct in coordination with the weights of its items. If the error term is large and the item weights are significant, then it is possible that the full domain of the construct is not fully captured. If the error term is large and many items are not significant, then a misspecification of the construct is likely. Conversely, if the error term is small and many item weights are not significant then multicollinearity may be an issue. Diamantopoulos recommends Cohen’s estimates of multiple regression effect sizes as a guide to determine whether the error term is small (R2 = .0196), moderate (.15), or large (R2 = .26) (Cohen 1988a; Diamantopoulos 2006). The error term for system quality was calculated by obtaining the unstandardized latent variable scores calculated via the PLS algorithm. A calculation of the standard error of these scores in SPSS yielded a moderate value of .184, indicating that the problems identified above are not an issue.

Finally, the system quality was assessed in terms of its performance in the overall structural model (Petter et al. 2007b). In this assessment, formative constructs are evaluated the same as reflective constructs. Within PLS models, constructs display predictive power when their path coefficients are above .20 (ideally above .30) and explain a sufficiently high amount of variance in related endogenous variables (Chin 1998a). In the present model, the coefficient for the path from *system quality* to *trust* is .56 and is highly significant ($p < .001$). The variance of *trust* explained by *system quality* is .32. In summary, from the foregoing tests it is clear that *system quality* displays good content and construct validity and demonstrates excellent predictive power.

Appendix 3D. Assessment of Moderating Effect

The moderating of effect of risk beliefs on the relationship between trust and IT adoption was tested in PLS using the product indicator approach (Chin et al. 2003a). Although the statistical power advantage of the product indicator approach has been called into question by Goodhue et al., they affirm that the product indicator approach is just as valid as other statistical tests should a significant path coefficient for the moderating effect be found (2007). A significant moderating effect was found (t-statistic 2.226; $p < .05$, two-tailed).

To further assess the hypothesized moderation, the effect size was calculated using the following formula (Mathieson et al. 2001) (Chin et al. 2003a):

$$\frac{R^2_{Full} - R^2_{Partial}}{1 - R^2_{Full}}$$

This yielded a score of .023, indicating a small effect size (Cohen 1988a). This is consistent with the small path coefficient (.14) which is too low to be considered meaningful (Chin 1998a).

Finally, an F-statistic was calculated to determine the significance of the change in explained variance between the moderated and additive model. To do so, the following formula suggested by Carte and Russell (Carte et al. 2003) was calculated:

$$\frac{\Delta R^2/(df_{Full} - df_{Partial})}{(1 - R^2_{Full})/(N - df_{Partial} - 1)}$$

This yielded an insignificant F-statistic of 2.5197 ($p = .115$), indicating that the moderating effect is not statistically significant. In summary, although the moderating path coefficient is significant, the insignificant change in R^2 indicates that the moderating effect does not exist (Carte et al. 2003). Thus, hypothesis 5 is not supported.

Appendix 3E. Assessment of Common Methods Bias

To reduce the likelihood of common methods bias, the study was designed to measure the predictor and criterion variables from different sources (Podsakoff et al. 2003a). The predictor variables were measured via a posttest after the simulation was performed. The criterion variable—*TQN adoption*—was measured from the logs of the TQN simulation. However, the occurrence of common methods bias is still possible do to item-context-induced mood states, priming effects, and other instrumentation artifacts (Podsakoff et al. 2003a). For this reason, several tests were performed to rule out common methods bias as a factor in this study.

First, Harman's one-factor test was performed (Podsakoff et al. 2003a). In this test, all items are entered into an unrotated exploratory factor analysis to determine whether a single factor emerges or a single factor accounts for the majority of the variance. In this case, 18 factors emerged, the largest of which accounted for 28 percent of the variance. Both results indicate that common methods bias is not an issue in this study.

Since Harman's one-factor test is increasingly contested for its ability to detect common methods bias (Podsakoff et al. 2003a), an additional test was performed suggested by Pavlou et al. (2007a). In their test, the construct correlation matrix as calculated by PLS (reported in Table B2) is examined to determine whether any constructs correlate extremely high (greater than .90). In the present case, none of the constructs were so highly correlated. This finding also indicates that common methods bias is not a problem.

Finally, a more rigorous test of common methods bias test suggested by Podsakoff et al. (2003) and adapted to PLS by Liang et al. (2007) was performed. The purpose of this technique is to measure the influence of common methods bias on indicators vis-à-vis the influence of the theorized substantive constructs in the model.

To perform this technique in PLS, constructs of the theoretical model and their relationships are modeled as per a typical analysis. Additionally, a single-indicator construct is created for each indicator in the measurement model. Each substantive construct is linked to the single-indicator constructs of indicators that comprise the construct. This effectively makes each substantive construct in the model a second-order reflective construct. Finally, a construct representing the method is created, reflectively composed of all indicators of the instrument. The method construct is then linked to each single-item construct. Figure E1 depicts this approach. One exception to this procedure was made—because *TQN adoption* was measured via a different source than the independent variables, the item for *TQN adoption* was not linked to the single-item construct.

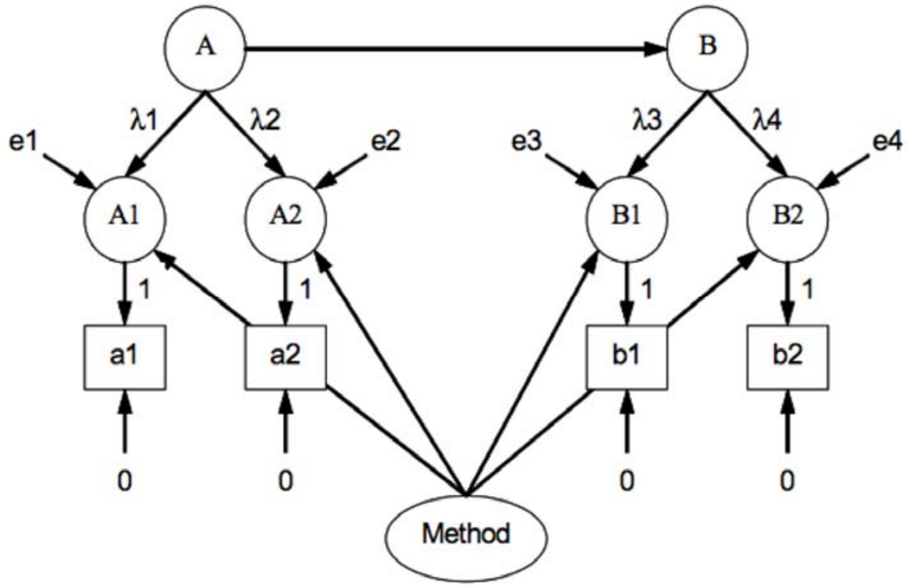

Figure E1. Liang et al.'s example of converting indicator into single-indicator constructs. Taken from Figure E2 of Liang et al. (2007).

To interpret these results, the coefficients of the paths between the substantive constructs and the single-indicator constructs, as well as the coefficients of paths from the method factor to the single-indicator constructs, are considered loadings, represented by λ in the table (Marcoulides and Moustaki 2002). Following Williams (2003), common method bias can be assessed by examining the statistical significance of the loadings of the method factor and by comparing the variance of each indicator as explained by the substantive and method factors.

The square of the substantive factor loading is interpreted as the percent of indicator variance explained by the substantive factor, and the square of the method factor loading is interpreted as the percent of indicator variance explained by the method factor. If the method factor loadings are generally insignificant, and the percent of indicator variance due to substantive constructs are substantially greater than the percent of indicator variance due to the method construct, then common methods bias is not likely to be a concern.

Applying these guidelines, it can be seen that variance of indicators due to substantive constructs is substantially greater than that due to the method construct. The average variance due to substantive constructs is 59 percent versus 5 percent for the method constructs, a ratio of nearly 12 to 1. This indicates that the influence due to the method factor was considerably smaller than that due to substantial factors. Examining the significance of loadings of the method factor, only one is found significant. Therefore, in light of the previous test for common methods variance, and the results of this procedure, it can be concluded that the results contain a negligible influence due to common methods bias.

Table E1. Common Method Bias Analysis

Construct	Indicator	Substantive Factor Loading (λ_s)	Variance explained (λ_s^2)	Method Factor Loading (λ_m)	Variance Explained (λ_m^2)
Formal Sanctions	ANYN2R	0.78***	0.61	-0.03	0.00
	ANYN5R	0.80***	0.64	-0.08	0.01
	ANYN7R	0.65***	0.42	0.14	0.02
System Quality	QUAL1	1.05**	1.10	-0.48	0.23
	QUAL2	0.43	0.19	0.26	0.07
	QUAL3	0.17	0.03	0.63 **	0.39
	QUAL4	0.94***	0.89	-0.25	0.06
	QUAL6	0.77***	0.59	0.09	0.01
	QUAL7	0.55**	0.30	0.21	0.04
	QUAL8	0.97***	0.94	-0.22	0.05
Risk Beliefs	RISK1	0.84***	0.71	0.09	0.01
	RISK2	0.88***	0.77	0.01	0.00
	RISK3	0.87***	0.76	-0.10	0.01
Trust	TQN1	0.72***	0.52	0.15	0.02
	TQN2R	0.64***	0.41	-0.07	0.01
	TQN3	0.79***	0.62	0.02	0.00
	TQN5	0.81***	0.66	-0.04	0.00
	TQN6R	0.74***	0.54	-0.10	0.01
Average		0.74	0.59	0.01	0.05

* $p < .025$, ** $p < .01$, *** $p < .005$
N.B. Intention is not included in the above analysis because it is itself a single item construct and is not amenable to this technique. Please refer to the construct correlation matrix to assess CMV for this construct

Appendix 3F. Assessment of Control Variables

This study measured three basic demographic data as control variables: age, years in college, and gender. To assess the affect of these control variables, each was modeled to directly influence the dependent variable, *IT adoption*, in a PLS model with no independent variables. The results of the PLS algorithm shows that only age significantly influenced the dependent variable (-.18, $p < .05$). However, the path coefficient was below the .20 threshold of what constitutes a meaningful path coefficient (Chin 1998a). The explained variance for the control variables alone was .03.

Next, the full model, including the control variables, was run yielding an R^2 of .21. In the full model, *age* again was the only significant control variable with a path coefficient of -.20 ($p < .025$). To test whether the difference in explained variance between the full model and the control variables alone, a pseudo F-test was performed (Chin et al. 2003a). The pseudo F-test is obtained by first calculating the effect size using the following formula:

$$\frac{R^2_{Full} - R^2_{Partial}}{1 - R^2_{Full}}$$

This formula yielded an effect size of .23, denoting a medium effect size (Cohen 1988a). The pseudo F-statistic was then calculated by multiplying the effect size by $(n - k - 1)$, where n is the sample size (117) and k is the number of independent variables (in this case 8 including the three control variables), resulting in an F-statistic of 24.33 ($p < .001$). Thus, although the age of the participants significantly affect intention to adopt, the full model explained significantly more variance than the control variables alone, indicating that results were not unduly influenced by the control variables.

Appendix 3G. Overview of the TQN Model

The Trusted Query Network (TQN) model is a distributed and peer-to-peer architecture for risk data generation, aggregation, management and analysis. Risk of disclosure is reduced by containing data within a trusted federation in which members of the federation and their data are kept anonymous.

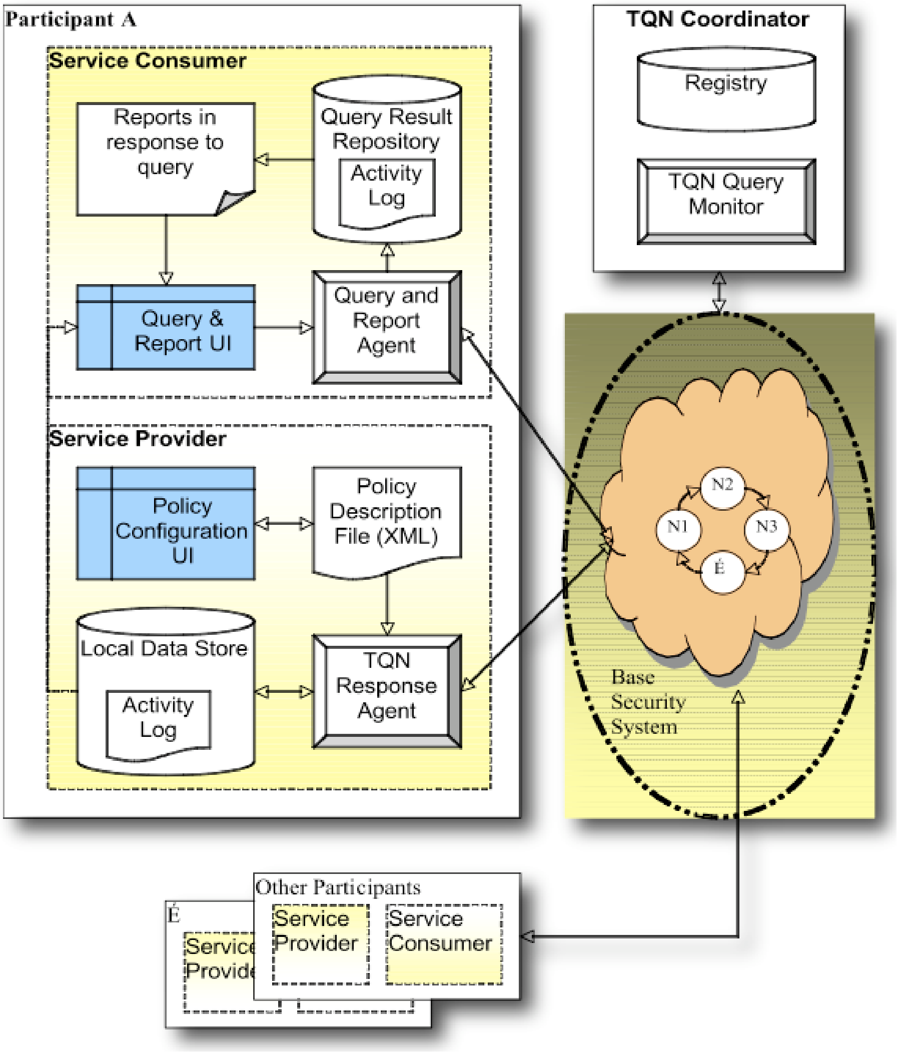
Participant A
Service Consumer
Reports in response to query
Query Result Repository
Activity Log
Query & Report UI
Query and Report Agent
Service Provider
Policy Configuration UI
Policy Description File (XML)
Local Data Store
Activity Log
TQN Response Agent
TQN Coordinator
Registry
TQN Query Monitor
N1
N2
N3
É
Base Security System
Other Participants
Service Provider
Service Consumer
É
Service Provider

Figure 4. Architecture of the TQN System

A Trusted Query Network protocol provides the communication mechanism for the architecture. Participating organizations store their own risk data locally, with complete control over its access and release—there is no reliance on a third party. Since it is unnecessary for organizations to trust a third party, and there is no data access except where a company chooses to release its data as included in an aggregated data set, organizations participation may participate without risk of data disclosure. The inhibition to sharing data is overcome specifically because any data released is only as part of an aggregated set—there is no organizational specific data that can be seen. In turn, any organization that participates by contributing data in turn obtains valuable information from other organizations (in aggregate) quickly (not as a result of a months-long reporting process) and effectively (in response to a direct, specific query of interest) for their emergent decision. For a full description of the TQN model, see (Vaishnavi et al. 2006).

Appendix 4A. Measurement Scales

Table A1. Measurement of Constructs

Latent Construct	Latent Construct Type	Subconstruct	Subconstruct Type	Number of Items	Citation
General Web experience	Formative	N/A	N/A	6	(McKnight et al. 2002e)
Perceived Web site quality	Formative	N/A	N/A	5	(McKnight et al. 2002e)
Media exposure	Covariate	N/A	N/A	1	(Malhotra et al. 2004b)
Privacy victim	Covariate	N/A	N/A	1	(Malhotra et al. 2004b)
Personal misrepresentation of information	Covariate	N/A	N/A	1	(Malhotra et al. 2004b)
Disposition to trust	Second-order formative factor	Benevolence Integrity Competence Trusting stance	Reflective Reflective Reflective Reflective	3 3 3 3	(McKnight et al. 2002e)
Institution-based trust	Second-order formative factor	SN –General SN –Benevolence SN –Integrity SN –Competence Structural Assurance	Reflective Reflective Reflective Reflective Reflective	2 3 3 3 4	(McKnight et al. 2002e)
Risk beliefs	Reflective	N/A	N/A	5	(Malhotra et al. 2004b)
Understanding of Web assurance seals	Formative	N/A	N/A	7	(Moores 2005, p. 90)
Privacy policy understanding	Formative	N/A	N/A	5	Created based on (Moores 2005, p. 90)
Seal assurance	Reflective	N/A	N/A	3	(Lee et al. 2004)
Branding	Formative	N/A	N/A	7	(Lastovicka et al. 1979)
Brand image	Formative	N/A	N/A	5	(Javalgi et al. 1994)
Trusting beliefs	Second-order formative factor	Benevolence Integrity Competence	Reflective Reflective Reflective	3 4 4	(McKnight et al. 2002e)
Intention to transact (Trusting intentions)	Second-order formative factor	Willingness to Depend SPD—Follow Advice SPD—Give Info. SPD—Make purchases	Reflective Reflective Reflective Reflective	4 6 3 3	(McKnight et al. 2002e)
Perceived risk	Reflective	N/A	N/A	4	(Gefen 2002a)
Perception of privacy assurance	Formative	N/A	N/A	7	(Rifon et al. 2005)
Intention to disclose information	Formative	N/A	N/A	17	(Rifon et al. 2005)

Table A2. Measurement Items

Construct	Subconstruct	Code	Items	Author
General Web experience (formative construct)	N/A		On average, how much time per week do you spend on each of the following Web activities? (Scale: 0=none, 1=1–2 hours, 2=3–4 hours, 3=5–6 hours, 4=7–8 hours, 5=9–10 hours, 6=11–12 hours, 7=13+ hours)	(McKnight et al. 2002e)
		GWE1	…reading newspapers on the Web?	
		GWE2	…reading and/or posting messages to news groups?	
		GWE3	…accessing information on the Web about products and services you may buy?	
		GWE4	…shopping (i.e., actually purchasing something) on the Web?	
		GWE5	…visiting social networking sites (e.g., MySpace, FaceBook, etc.)	
		GWE6	…any other Web-based activities not listed above.	
Perceived Web site quality (formative construct)	N/A	**PWQ1**	Overall, MyTripCreator.com would work very well technically.	(McKnight et al. 2002e)
		PWQ2	Visually, MyTripCreator.com resembles other travel reservation sites of which I think highly.	
		PWQ3	MyTripCreator.com would be simple to navigate.	
		PWQ4	It would be easy to find the information I wanted on MyTripCreator.com.	
		PWQ5	MyTripCreator.com would clearly show how I could contact or communicate with the owners.	
Media exposure (covariate)	N/A	**EXP1**	How much have you heard or read during the last year about the use and potential misuse of the information collected from the Internet? (1=not at all; 7=very much)	(Malhotra et al. 2004b)
Privacy victim (covariate)	N/A	**EXP2**	How frequently have you personally been the victim of what you felt was an improper invasion of privacy? (1=very infrequently, 7= very frequently)	
Personal misrepresentation of information (covariate)	N/A	**EXP3**	Some Web sites ask you to register with the site by providing personal information. When asked for such information, what percent of the time do you falsify the information? (1=I have never falsified information; 2=under 25% of the time; 3=26%–50% of the time; 4=51%–75% of the time; 5=over 75% of the time).	

Construct	Subconstruct	Code	Items	Author
Disposition to trust (second-order formative factor)	DT-Benevolence (DTB) (reflective)	**DTB1** **DTB2** **DTB3**	In general, people really do care about the wellbeing of others. The typical person is sincerely concerned about the problems of others. Most of the time, people care enough to try to be helpful, rather than just looking out for themselves.	(McKnight et al. 2002e)
	DT-Integrity (DTI) (reflective)	**DTI1** **DTI2** **DTI3**	In general, most folks keep their promises. I think people generally try to back up their words with their actions. Most people are honest in their dealings with others.	
	DT-Competence (DTC) (reflective)	**DTC1** **DTC2** **DTC3**	I believe that most professional people do a very good job at their work. Most professionals are very knowledgeable in their chosen field. A large majority of professional people are competent in their area of expertise	
	DT-Trusting stance (DTTS) (reflective)	**DTTS1** **DTTS2** **DTTS3**	I usually trust people until they give me a reason to doubt when I first meet them. I generally give people the benefit of the doubt when I first meet them. My typical approach is to trust new acquaintances until they prove I should not trust them.	
Institution-based trust (second-order formative factor)	Situational normality-general (SNG) (reflective)	**SNG1** **SNG2**	I feel good about how things go when I do purchasing or other activities on the Internet. I am comfortable making purchases on the Internet.	(McKnight et al. 2002e)
	Situational normality-benevolence (SNB) (reflective)	**SNB1** **SNB2** **SNB3**	I feel that most Internet vendors would act in a customer's best interest. If a customer required help, most Internet vendors would do their best to help. Most Internet vendors are interested in customer well-being, not just their own well-being.	
	Situational normality-integrity (SNI) (reflective)	**SNI1** **SNI2** **SNI3**	I am comfortable relying on Internet vendors to meet their obligations. I feel fine doing business on the Internet since Internet vendors generally fulfill their agreements. I always feel confident that I can rely on Internet vendors to do their part when I interact with them.	

Construct	Subconstruct	Code	Items	Author
	Situational normality-competence (SNC) (reflective)	**SNC1** **SNC2** **SNC3**	In general, most Internet vendors are competent at serving their customers. Most Internet vendors do a capable job at meeting customer needs. I feel that most Internet vendors are good at what they do.	
	Structural assurance (SA) (reflective)	**SA1** **SA2** **SA3** **SA4**	The Internet has enough safeguards to make me feel comfortable using it to transact personal business. I feel assured that legal and technological structures adequately protect me from problems on the Internet. I feel confident that encryption and other technological advances on the Internet make it safe for me to do business there. In general, the Internet is now a robust and safe environment in which to transact business.	
Risk beliefs (RB) (reflective construct)	N/A	**RB1** **RB2** **RB3** **RB4** **RB5***	In general, it would be risky to give my personal information to online companies. There would be high potential for loss associated with giving my personal information to online companies. There would be too much uncertainty associated with giving my personal information to online companies. Providing online companies with my personal information would involve many unexpected problems. I would feel safe giving my personal information to online companies.	Original from (Jarvenpaa et al. 1999) improved by (Malhotra et al. 2004b)

Construct	Subconstruct	Code	Items	Author
Understanding of Web assurance seals (formative construct)	N/A	**UWAS1**	Web assurance seals are designed to increase the trust a customer has for a Web site.	(Moores 2005, p. 90)
		UWAS2	Web sites must state how they collect and share data in order to be awarded a Web assurance seal.	
		UWAS3	Third-party organizations assess the business practices of a Web site before awarding a seal.	
		UWAS4	You can click on the seal to verify that the Web site is entitled to display the seal.	
		UWAS5*	There is no fee for applying for and/or receiving a seal.	
		UWAS6*	Everyone that applies for a seal gets one.	
		UWAS7	A Web site must display a data privacy statement in order to get a seal.	
Privacy policy understanding (formative construct)	N/A	**PPU1**	Privacy policies always ensure that no one will be given access to your online information.	New scale based on the concepts of Web seal understanding but applied to privacy policies (Moores 2005, p. 90)
		PPU2	Privacy policies voluntarily govern all aspects of how a company collects, uses, maintains and discloses personal information from all users.	
		PPU3*	Privacy policies are mandated and controlled by the U. S. Government.	
		PPU4	Privacy policies are strictly voluntary and are free of government control.	
		PPU5	It is possible for a company to have a privacy policy but to freely distribute your personal information to third parties.	
Seal assurance (reflective construct)	N/A	**SEAL1**	Web assurance seals make me feel safe in online purchasing.	(Lee et al. 2004)
		SEAL2	Web assurance seals make me feel comfortable toward the Web retailers.	
		SEAL3	Web assurance seals are trustworthy.	

Construct	Subconstruct	Code	Items	Author
Branding (formative construct)	N/A	**BRAND1**	The service of travel arrangements is something that I could talk about for a long time.	(Lastovicka et al. 1979)
		BRAND2	I understand travel information well enough to evaluate the major travel arrangement brands.	
		BRAND3	Travel booking is a service that interests me.	
		BRAND4	I have a preference for one or more brands in this travel arrangements service class.	
		BRAND5*	Travel arrangement is a service for which I have no need whatsoever.	
		BRAND6*	I am not at all familiar with this type of service (travel arrangements).	
		BRAND7	I usually make travel arrangements with the same company.	
Brand image (formative construct)	N/A		In real life, I would view the company running the travel booking Web site previously viewed to . . .	(Javalgi et al. 1994)
		IMAGE1	Have good products/services	
		IMAGE2	Be well managed	
		IMAGE3*	Only want to make money	
		IMAGE4	Respond to consumer needs	
		IMAGE5	Be a good company for which to work	
Trusting beliefs (second-order formative factor)	TB-Benevolence (TBB) (reflective)	**TBB1**	I believe that MyTripCreator.com would act in my best interest.	(McKnight et al. 2002e)
		TBB2	If I required help, MyTripCreator.com would do its best to help me.	
		TBB3	MyTripCreator.com is interested in my wellbeing, not just its own.	
	TB-Integrity (TBI) (reflective)	**TBI1**	MyTripCreator.com would be truthful in its dealings with me.	
		TBI2	I would characterize MyTripCreator.com as honest.	
		TBI3	MyTripCreator.com would keep its commitments.	
		TBI4	MyTripCreator.com would be sincere and genuine.	

Construct	Subconstruct	Code	Items	Author
	TB-Competence (TBC) (reflective)	**TBC1**	MyTripCreator.com would be competent and effective in providing online reservation services.	
		TBC2	MyTripCreator.com would perform its role of providing opportunities for online reservations very well.	
		TBC3	Overall, MyTripCreator.com would be a capable and proficient Internet travel reservation provider.	
		TBC4	In general, MyTripCreator.com would be very knowledgeable about online travel bookings.	
Trusting intentions (intention to transact) (second-order formative factor)	TI-Willingness to Depend (TIWD) (reflective)	**TIWD1 (d)**	When an important reservation opportunity arose, I would feel comfortable depending on the information provided by MyTripCreator.com.	(McKnight et al. 2002e)
		TIWD2	I would be able to rely on MyTripCreator.com in a tough travel reservation situation.	
		TIWD3	I would feel that I could count on MyTripCreator.com to help with a crucial online travel reservation problem.	
		TIWD4 (d)	Faced with a difficult reservation situation that required me to change my flight and hotel plans, I would use the airline and hotel suggested by MyTripCreator.com.	
	TI-Subjective probability of depending—follow advice (TIFA) (reflective)	**TIFA1 (d)**	If I had a challenging travel reservation problem, I would use MyTripCreator.com.	
		TIFA2	I would feel comfortable acting on the travel information given to me by MyTripCreator.com.	
		TIFA3 (d)	I would not hesitate to use the travel information MyTripCreator.com supplied me.	
		TIFA4	I would confidently act on the travel reservation advice I was given by MyTripCreator.com.	
		TIFA5 (d)	I would feel secure in using the travel information from MyTripCreator.com.	
		TIFA6	I would reserve a flight and hotel following advice from MyTripCreator.com.	

Construct	Subconstruct	Code	Items	Author
	TI-Subjective probability of depending—give information (TIGI) (reflective)		Suppose you wanted more specific information about online travel reservations and you could consult (one time only) by telephone with one of the MyTripCreator.com employees for 15–30 minutes (free of charge). For this service, please answer the following:	
		TIGI1 (d)	I would be willing to provide information like my name, address, and phone to MyTripCreator.com.	
		TIGI2	I would be willing to provide my social security number to MyTripCreator.com.	
		TIGI3	I would be willing to share the specifics of my travel plans with MyTripCreator.com.	
	TI-Subjective probability of depending—make purchases (TIMP) (*reflective*)		Suppose that MyTripCreator.com was not free, but charged to access information on the site. Answer the following questions:	
		TIMP1	Faced with a difficult travel situation, I would be willing to pay to access information on the MyTripCreator.com Web site.	
		TIMP2	I would be willing to provide my credit card information on the MyTripCreator.com Web site.	
		TIMP3	Given a difficult reservation situation, I would be willing to pay for a 30-minute phone consultation with a MyTripCreator.com employee.	
Perceived risk (PR) (reflective construct)	N/A	**PR1**	There would be a significant threat doing business with MyTripCreator.com.	(Gefen 2000b)
		PR2	There would be a significant potential for loss in doing business with MyTripCreator.com.	
		PR3	There would be a significant risk in doing business with MyTripCreator.com.	
		PR4	My credit card information may not be secure with MyTripCreator.com.	

Construct	Subconstruct	Code	Items	Author
Perception of privacy assurance (formative construct)			How likely would it be that MyTripCreator.com would tell you the following?	(Rifon et al. 2005)
		ASSURE1	What personal information is being gathered about you	
		ASSURE2	How the information will be used	
		ASSURE3	Who the information will be shared with, if anyone	
		ASSURE4	About choices available to you	
		ASSURE5	Regarding how information is used	
		ASSURE6	Safeguards in place to protect your information from loss, misuse, or alteration	
		ASSURE7	How you can update or correct inaccuracies in your information	
Intention to disclose information			What is the likelihood that you would give the following information over the Internet to MyTripCreator.com?	(Rifon et al. 2005)
		LID1	Name	
		LID2	Home mailing address	
		LID3	Business mailing address	
		LID4	E-mail address	
		LID5	Cell phone number	
		LID6	Ethnicity	
		LID7	Mother’s maiden name	
		LID8	Religious preferences	
		LID9	Personal MySpace / Facebook profile	
		LID10	Product preferences	
		LID11	Credit card number	
		LID12	Medical information	
		LID13	Salary information	
		LID14	Social security number	
		LID15	Sexual orientation	
		LID16	Date of birth	
		LID17	Family information (e.g., children’s names/ages, marital status)	

* = reverse coded item; (d) = item dropped to improve discriminant validity

Except where noted, all items were anchored as 7-point Likert-like scales *(1–strongly disagree . . . 7–strongly agree)*

Appendix 4B. Validation Procedures

Establishing Factorial Validity

A key step before assessing factorial validity, which has recently come to light in IS research, is to determine which constructs are formative and which are reflective (Diamantopoulos et al. 2001b).[12] We used Diamantopoulos and Winklhofer (2001b) as the basis for determining where we had formative and reflective constructs.

Validation of Reflective Indicators

To establish the factorial validity of our reflective indicators, we followed procedures by Gefen and Straub (2005e). To establish convergent validity, we generated a bootstrap with 200 resamples. We then examined the t-values of the outer model loadings; all of the outer loadings were significant at the .05 α level (Table B1). These results indicate strong convergent validity in our model for the reflective constructs.

Table B1. T-statistics for Convergent Validity

Latent Construct	Subconstruct	Indicator	t-statistic
Disposition to Trust	Beliefs	dtb1	67.40***
		dtb2	84.66***
		dtb3	41.46***
	Intentions	dti1	55.68***
		dti2	60.49***
		dti3	42.60***
	Competence	dtc1	48.56***
		dtc2	66.06***
		dtc3	52.42***
	Trusting Stance	dtts1	99.72***
		dtts2	52.27***
		dtts3	102.37***
Institution-Based Trust	Situational Normality-General	sng1	129.07***
		sng2	129.07***
	Situational Normality-Benevolence	snb1	54.73***
		snb2	55.22***

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[12] Should researchers make a default assumption that all constructs are reflective, they risk invalidating the results of the factorial validity tests. A high percentage of the recent research in *MISQ* and *ISR* mis-specifies constructs as reflective when they are actually formative, leading to problems in empirical results and theoretical interpretations ,including the potential increase in both Type I and Type II errors (Petter et al. 2007). A key sign that one is dealing with a formative measure is that the items of a construct are not interchangeable, as they are in reflective measures.

Latent Construct	Subconstruct	Indicator	t-statistic
		snb3	70.34***
	Situational Normality-Integrity	sni1	95.13***
		sni2	87.59***
		sni3	64.74***
	Situational Normality-Competence	snc1	93.06***
		snc2	112.08***
		snc3	56.42***
	Structural Assurance	sa1	69.93***
		sa2	97.09***
		sa3	75.90***
		sa4	66.36***
Risk Beliefs	N/A	rb1	50.96***
		rb2	39.15***
		rb3	88.99***
		rb4	54.52***
		rb5	23.28***
Seal Assurance	N/A	seal1	118.43***
		seal2	88.80***
		seal3	47.09***
Trusting Beliefs	Benevolence	tbb1	90.02***
		tbb2	71.08***
		tbb3	49.98***
	Integrity	tbi1	62.62***
		tbi2	60.63***
		tbi3	61.88***
		tbi4	67.83***
	Competence	tbc1	85.29***
		tbc2	75.87***
		tbc3	68.91***
		tbc4	47.45***
Trusting Intentions	Willingness to Depend	tiwd1	96.97***
		tiwd2	118.42***
		tiwd3	95.05***
		tiwd4	59.73***
	Subjective Probability of Depending—Follow Advice	tifa1	52.22***
		tifa2	130.48***
		tifa3	73.69***
		tifa4	103.93***
		tifa5	81.89***
		tifa6	59.75***
	Subjective Probability of Depending—Give Information	tigi1	74.10***
		tigi2	10.84***
		tigi3	50.41***
	Subjective Probability of Depending—Make Purchases	timp1	100.66***
		timp2	28.00***
		timp3	46.40***
Perceived Risk	N/A	pr1	112.81***

Latent Construct	Subconstruct	Indicator	t-statistic
		pr2	126.46***
		pr3	146.73***
		pr4	42.27***

*$p < 0.05$, ** $p < 0.01$, ***$p < 0.001$

To establish discriminant validity of our reflective indicators, we used two established techniques: (1) correlating the latent variable scores against the indicators (Table B2) and (2) calculating the average variance extracted (AVE) (see Table B3). Both analyses indicate very strong discriminant validity. All of the constructs were highly discriminated in the first technique, except for the second-order factor of intention to transact, which had six overlapping items in its four subconstructs. These items were removed to improve discriminant validity.

Table B2. Discriminant Validity with Latent Scores

	GWE	DTB	DTI	DTC	DTTS	SNG	SNB	SNI	SNC	SA	RB	SEAL
gwe1	0.455	0.014	-0.016	-0.055	-0.025	0.071	0.066	0.079	0.032	0.060	-0.036	-0.001
gwe2	0.546	-0.001	-0.036	0.030	-0.015	-0.015	0.008	-0.006	0.016	0.039	0.074	0.006
gwe3	0.686	-0.004	0.068	0.037	0.038	0.182	0.144	0.160	0.122	0.131	-0.056	0.087
gwe4	0.634	-0.051	-0.001	-0.010	-0.020	0.119	0.097	0.122	0.092	0.133	-0.025	0.108
gwe5	0.588	-0.006	-0.021	0.054	0.031	0.032	-0.014	-0.020	0.026	0.018	0.019	0.057
gwe6	0.489	0.023	0.052	0.061	0.036	0.110	0.093	0.121	0.113	0.039	-0.082	0.008
dtb1	-0.038	0.849	0.480	0.333	0.384	0.185	0.220	0.135	0.207	0.180	-0.100	0.105
dtb2	-0.028	0.865	0.420	0.283	0.345	0.119	0.213	0.106	0.123	0.132	-0.034	0.085
dtb3	0.052	0.798	0.461	0.277	0.342	0.153	0.238	0.146	0.179	0.142	-0.059	0.106
dti1	0.000	0.489	0.814	0.345	0.318	0.149	0.233	0.183	0.202	0.180	-0.122	0.133
dti2	0.029	0.414	0.825	0.380	0.282	0.143	0.204	0.174	0.206	0.175	-0.084	0.143
dti3	0.004	0.411	0.791	0.342	0.318	0.140	0.219	0.175	0.222	0.230	-0.075	0.120
dtc1	0.055	0.312	0.404	0.821	0.250	0.101	0.199	0.148	0.224	0.105	0.005	0.090
dtc2	0.022	0.281	0.341	0.872	0.246	0.138	0.156	0.135	0.265	0.094	-0.022	0.103
dtc3	0.012	0.312	0.373	0.846	0.279	0.138	0.212	0.169	0.287	0.104	-0.031	0.102
dtts1	0.032	0.401	0.345	0.288	0.896	0.140	0.168	0.128	0.178	0.121	-0.058	0.096
dtts2	0.001	0.348	0.314	0.269	0.845	0.172	0.183	0.156	0.213	0.154	-0.034	0.078
dtts3	0.001	0.375	0.338	0.249	0.901	0.120	0.190	0.152	0.181	0.138	-0.032	0.097
sng1	0.128	0.165	0.165	0.159	0.153	0.928	0.494	0.608	0.528	0.474	-0.260	0.282
sng2	0.145	0.172	0.165	0.117	0.149	0.928	0.546	0.699	0.563	0.590	-0.346	0.285
snb1	0.097	0.207	0.190	0.137	0.148	0.553	0.836	0.622	0.541	0.507	-0.278	0.226
snb2	0.093	0.196	0.246	0.240	0.190	0.479	0.830	0.588	0.558	0.420	-0.197	0.244
snb3	0.101	0.265	0.242	0.181	0.176	0.373	0.842	0.533	0.454	0.418	-0.154	0.230
sni1	0.121	0.151	0.217	0.162	0.130	0.642	0.632	0.895	0.636	0.578	-0.352	0.313
sni2	0.115	0.120	0.185	0.165	0.158	0.673	0.632	0.898	0.650	0.576	-0.344	0.288
sni3	0.120	0.133	0.176	0.142	0.146	0.543	0.571	0.848	0.575	0.500	-0.265	0.261
snc1	0.101	0.156	0.203	0.254	0.180	0.514	0.540	0.646	0.893	0.454	-0.210	0.214
snc2	0.115	0.182	0.224	0.273	0.176	0.562	0.571	0.655	0.914	0.487	-0.209	0.205
snc3	0.098	0.198	0.264	0.286	0.220	0.485	0.534	0.571	0.849	0.466	-0.159	0.203
sa1	0.095	0.141	0.208	0.084	0.110	0.538	0.482	0.591	0.481	0.878	-0.383	0.337
sa2	0.118	0.155	0.204	0.096	0.141	0.471	0.452	0.520	0.437	0.888	-0.286	0.300

sa3	0.136	0.190	0.235	0.125	0.164	0.509	0.473	0.535	0.469	0.879	-0.222	0.320
sa4	0.083	0.145	0.191	0.113	0.131	0.486	0.467	0.544	0.463	0.849	-0.327	0.309
rb1	-0.020	-0.076	-0.111	0.005	-0.024	-0.253	-0.219	-0.304	-0.182	-0.309	0.807	-0.143
rb2	-0.034	-0.014	-0.056	0.027	-0.003	-0.176	-0.125	-0.191	-0.084	-0.168	0.783	-0.088
rb3	-0.032	-0.030	-0.067	0.012	-0.008	-0.263	-0.221	-0.311	-0.170	-0.301	0.868	-0.132
rb4	0.003	-0.061	-0.095	-0.015	-0.057	-0.265	-0.171	-0.267	-0.183	-0.217	0.814	-0.137
rb5	-0.042	-0.137	-0.140	-0.122	-0.107	-0.353	-0.269	-0.387	-0.261	-0.405	0.681	-0.252
seal1	0.073	0.119	0.140	0.112	0.089	0.298	0.260	0.312	0.212	0.329	-0.172	0.926
seal2	0.066	0.101	0.138	0.079	0.090	0.302	0.271	0.310	0.240	0.341	-0.167	0.928
seal3	0.072	0.097	0.163	0.125	0.099	0.217	0.219	0.254	0.176	0.306	-0.158	0.839
tbb1	0.071	0.072	0.058	0.091	0.025	0.121	0.164	0.146	0.119	0.220	-0.060	0.155
tbb2	0.026	0.123	0.079	0.108	0.095	0.102	0.123	0.141	0.173	0.183	-0.091	0.109
tbb3	0.006	0.103	0.074	0.100	0.072	0.117	0.173	0.147	0.108	0.198	-0.020	0.128
tbi1	-0.020	0.109	0.114	0.111	0.083	0.159	0.159	0.168	0.199	0.188	-0.065	0.127
tbi2	0.002	0.071	0.095	0.109	0.075	0.143	0.127	0.165	0.178	0.185	-0.113	0.094
tbi3	0.030	0.087	0.111	0.114	0.104	0.151	0.120	0.147	0.173	0.199	-0.047	0.131
tbi4	-0.012	0.075	0.067	0.057	0.036	0.097	0.138	0.129	0.135	0.157	-0.036	0.150
tbc1	0.028	0.070	0.043	0.097	0.080	0.123	0.110	0.133	0.172	0.166	-0.105	0.129
tbc2	-0.018	0.104	0.115	0.146	0.119	0.153	0.130	0.147	0.182	0.172	-0.056	0.112
tbc3	0.041	0.091	0.100	0.134	0.095	0.127	0.130	0.151	0.149	0.168	-0.067	0.160
tbc4	-0.015	0.026	0.058	0.146	0.028	0.094	0.066	0.083	0.122	0.127	-0.025	0.110
tiwd1	0.066	0.105	0.037	0.065	0.074	0.138	0.162	0.149	0.147	0.201	-0.101	0.136
tiwd2	0.035	0.040	0.000	0.039	0.007	0.128	0.115	0.102	0.122	0.152	-0.034	0.084
tiwd3	0.050	0.075	0.029	0.020	0.020	0.139	0.127	0.140	0.150	0.178	-0.050	0.102
tiwd4	0.053	0.075	0.048	0.071	0.071	0.118	0.088	0.103	0.119	0.134	-0.070	0.081
tifa1	0.026	0.034	0.035	0.053	0.015	0.078	0.062	0.044	0.103	0.120	-0.042	0.046
tifa2	0.080	0.085	0.023	0.036	0.052	0.123	0.119	0.119	0.141	0.195	-0.095	0.102
tifa3	0.117	0.090	0.043	0.058	0.065	0.143	0.161	0.146	0.159	0.193	-0.061	0.092
tifa4	0.076	0.121	0.051	0.039	0.077	0.122	0.143	0.155	0.159	0.206	-0.045	0.121
tifa5	0.039	0.102	0.054	0.066	0.076	0.155	0.146	0.159	0.152	0.207	-0.104	0.131
tifa6	0.066	0.105	0.069	0.072	0.091	0.103	0.111	0.101	0.112	0.150	-0.047	0.129
tigi1	0.023	0.084	0.057	0.101	0.103	0.126	0.094	0.132	0.120	0.156	-0.184	0.137
tigi2	0.011	0.077	0.051	0.054	0.065	-0.007	0.091	0.060	0.002	0.057	0.009	0.063
tigi3	-0.002	0.097	0.026	0.095	0.135	0.067	0.052	0.037	0.107	0.089	-0.066	0.066
timp1	-0.017	0.036	0.009	0.027	0.001	-0.044	0.005	-0.026	-0.027	-0.033	-0.013	0.056
timp2	0.051	0.093	0.052	0.072	0.074	0.126	0.120	0.123	0.080	0.129	-0.120	0.136
timp3	-0.007	0.077	-0.015	0.092	0.045	-0.004	0.018	0.011	0.020	-0.009	0.045	0.102
pr1	-0.019	-0.078	-0.024	-0.051	-0.039	-0.108	-0.097	-0.148	-0.127	-0.178	0.193	-0.062
pr2	-0.028	-0.047	-0.017	-0.052	-0.060	-0.078	-0.059	-0.115	-0.104	-0.127	0.165	-0.069
pr3	-0.019	-0.061	-0.026	-0.056	-0.065	-0.104	-0.093	-0.147	-0.123	-0.202	0.186	-0.075
pr4	-0.004	-0.065	-0.066	-0.101	-0.088	-0.140	-0.116	-0.182	-0.148	-0.209	0.204	-0.100

	TBB	TBI	TBC	TIWD	TIFA	TIGI	TIMP	P_RISK
gwe1	0.018	0.008	0.003	0.021	0.046	0.026	0.052	-0.053
gwe2	0.031	-0.028	0.011	0.032	0.059	0.005	0.031	-0.052
gwe3	0.022	-0.029	-0.035	0.042	0.040	-0.025	-0.020	0.010
gwe4	0.020	0.001	0.008	0.047	0.050	0.005	0.024	0.027
gwe5	0.109	0.065	0.089	0.072	0.071	0.039	0.014	-0.012
gwe6	-0.062	-0.018	-0.039	-0.022	-0.006	-0.002	-0.073	0.012
dtb1	0.098	0.117	0.096	0.059	0.066	0.140	0.077	-0.074
dtb2	0.105	0.075	0.079	0.059	0.077	0.084	0.096	-0.040
dtb3	0.088	0.057	0.036	0.090	0.115	0.064	0.037	-0.064
dti1	0.077	0.087	0.051	0.046	0.052	0.053	0.011	-0.026
dti2	0.066	0.084	0.087	0.008	0.035	0.041	0.015	-0.002
dti3	0.056	0.102	0.084	0.022	0.039	0.046	0.016	-0.060
dtc1	0.123	0.101	0.139	0.045	0.053	0.079	0.100	-0.055
dtc2	0.097	0.094	0.137	0.057	0.062	0.108	0.063	-0.072

dtc3	0.077	0.095	0.105	0.036	0.040	0.107	0.036	-0.055
dtts1	0.068	0.060	0.069	0.038	0.059	0.134	0.024	-0.034
dtts2	0.071	0.087	0.117	0.048	0.062	0.122	0.037	-0.063
dtts3	0.058	0.082	0.063	0.040	0.067	0.116	0.063	-0.088
sng1	0.123	0.149	0.144	0.138	0.121	0.086	0.035	-0.091
sng2	0.122	0.148	0.122	0.132	0.134	0.095	0.012	-0.131
snb1	0.154	0.140	0.099	0.095	0.098	0.095	0.044	-0.088
snb2	0.151	0.140	0.149	0.121	0.114	0.101	0.027	-0.081
snb3	0.143	0.118	0.068	0.128	0.140	0.060	0.067	-0.086
sni1	0.144	0.155	0.140	0.118	0.117	0.095	0.045	-0.148
sni2	0.136	0.164	0.135	0.140	0.140	0.092	0.018	-0.157
sni3	0.169	0.150	0.117	0.106	0.106	0.091	0.039	-0.131
snc1	0.148	0.194	0.173	0.136	0.148	0.103	0.012	-0.155
snc2	0.129	0.164	0.143	0.138	0.131	0.095	0.008	-0.115
snc3	0.137	0.173	0.163	0.124	0.137	0.112	0.050	-0.103
sa1	0.205	0.193	0.181	0.176	0.191	0.124	0.021	-0.160
sa2	0.194	0.175	0.139	0.185	0.193	0.126	0.000	-0.174
sa3	0.192	0.176	0.146	0.118	0.137	0.128	0.039	-0.147
sa4	0.228	0.197	0.173	0.168	0.189	0.119	0.046	-0.223
rb1	-0.037	-0.049	-0.048	-0.045	-0.060	-0.117	-0.068	0.164
rb2	-0.014	-0.035	-0.021	-0.019	-0.018	-0.077	0.008	0.155
rb3	-0.059	-0.059	-0.055	-0.078	-0.081	-0.094	-0.019	0.189
rb4	-0.018	-0.051	-0.054	-0.037	-0.033	-0.081	0.008	0.156
rb5	-0.154	-0.117	-0.123	-0.107	-0.110	-0.138	-0.060	0.171
seal1	0.102	0.104	0.110	0.078	0.078	0.102	0.109	-0.061
seal2	0.142	0.127	0.131	0.096	0.100	0.102	0.121	-0.068
seal3	0.172	0.167	0.160	0.131	0.144	0.130	0.093	-0.103
tbb1	0.884	0.728	0.679	0.527	0.542	0.404	0.229	-0.459
tbb2	0.858	0.696	0.682	0.527	0.548	0.439	0.207	-0.428
tbb3	0.825	0.656	0.602	0.416	0.446	0.384	0.195	-0.369
tbi1	0.709	0.874	0.723	0.487	0.531	0.420	0.174	-0.452
tbi2	0.680	0.858	0.735	0.494	0.528	0.398	0.202	-0.474
tbi3	0.701	0.851	0.763	0.531	0.558	0.410	0.220	-0.443
tbi4	0.694	0.853	0.707	0.496	0.512	0.429	0.218	-0.463
tbc1	0.649	0.748	0.892	0.522	0.556	0.454	0.223	-0.490
tbc2	0.673	0.760	0.872	0.538	0.557	0.433	0.208	-0.427
tbc3	0.706	0.763	0.883	0.578	0.623	0.475	0.226	-0.563
tbc4	0.628	0.684	0.824	0.467	0.492	0.352	0.166	-0.388
tiwd1*	0.554	0.577	0.590	0.899*	0.874	0.482	0.303	-0.529
tiwd2	0.512	0.525	0.537	0.910	0.828	0.440	0.335	-0.430
tiwd3	0.543	0.547	0.566	0.909	0.837	0.471	0.338	-0.482
tiwd4*	0.452	0.450	0.488	0.877*	0.791	0.458	0.276	-0.417
tifa1*	0.484	0.477	0.509	0.839	0.831*	0.440	0.304	-0.399
tifa2	0.547	0.578	0.596	0.848	0.924	0.487	0.305	-0.518
tifa3*	0.521	0.537	0.552	0.777	0.881*	0.447	0.264	-0.503
tifa4	0.537	0.545	0.554	0.811	0.904	0.452	0.301	-0.502
tifa5*	0.532	0.582	0.611	0.840	0.892*	0.494	0.251	-0.530
tifa6	0.557	0.567	0.586	0.805	0.871	0.514	0.325	-0.508
tigi1	0.439	0.450	0.490	0.484	0.510	0.857	0.297	-0.405
tigi2*	0.237	0.209	0.155	0.211	0.219	0.481*	0.306	-0.137
tigi3	0.359	0.372	0.387	0.401	0.407	0.821	0.138	-0.305
timp1	0.132	0.124	0.106	0.218	0.193	0.148	0.866	-0.085
timp2	0.383	0.395	0.400	0.453	0.457	0.436	0.704	-0.419
timp3	0.097	0.073	0.090	0.183	0.161	0.192	0.791	-0.020
pr1	-0.448	-0.492	-0.512	-0.475	-0.522	-0.371	-0.169	0.902
pr2	-0.438	-0.468	-0.476	-0.464	-0.488	-0.362	-0.174	0.915
pr3	-0.458	-0.490	-0.505	-0.479	-0.539	-0.364	-0.168	0.927
pr4	-0.391	-0.438	-0.415	-0.412	-0.425	-0.335	-0.223	0.794

* Item removed to improve discriminant validity

Table B3. Calculation of Discriminant Validity through the Square Root of AVE[13]

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
DTB (1)	0.702 (0.**838**)																		
DTI (2)	0.542	0.656 (0.**810**)																	
DTC (3)	0.357	0.441	0.717 (0.**847**)																
DTTS (4)	0.427	0.378	0.305	0.776 (0.**881**)															
SNG (5)	0.182	0.178	0.147	0.162	0.861 (0.**928**)														
SNB (6)	0.266	0.269	0.223	0.204	0.564	0.699 (0.**836**)													
SNI (7)	0.153	0.219	0.178	0.164	0.706	0.696	0.776 (0.**881**)												
SNC (8)	0.202	0.260	0.305	0.216	0.588	0.620	0.704	0.785 (0.**886**)											
SA (9)	0.180	0.239	0.119	0.155	0.577	0.538	0.626	0.530	0.763 (0.**874**)										
RB (10)	-0.081	-0.119	-0.023	-0.050	-0.334	-0.256	-0.368	-0.221	-0.356	0.629 (0.**793**)									
SEAL (11)	0.118	0.163	0.116	0.103	0.305	0.279	0.325	0.234	0.362	-0.190	0.807 (0.**898**)								
TBB (12)	0.117	0.082	0.118	0.075	0.132	0.179	0.170	0.157	0.235	-0.072	0.153	0.733 (0.**856**)							
TBI (13)	-0.051	-0.042	-0.022	-0.026	-0.020	-0.014	-0.031	0.003	-0.059	0.049	-0.015	0.036	0.738 (0.**859**)						
TBC (14)	0.084	0.091	0.151	0.092	0.142	0.126	0.148	0.180	0.183	-0.075	0.148	0.766	0.047	0.753 (0.**868**)					
TIWD (15)	0.061	0.015	0.031	0.014	0.140	0.127	0.127	0.143	0.174	-0.046	0.098	0.554	0.058	0.580	0.905 (0.**951**)				
TIFA (16)	0.113	0.052	0.054	0.080	0.127	0.135	0.136	0.150	0.201	-0.070	0.129	0.597	0.049	0.632	0.841	0.840 (0.**917**)			
TIGI (17)	0.103	0.047	0.111	0.136	0.111	0.084	0.097	0.129	0.140	-0.146	0.117	0.456	0.094	0.500	0.461	0.521	0.768 (0.**876**)		
TIMP (18)	0.087	0.019	0.082	0.051	0.033	0.060	0.046	0.032	0.038	-0.038	0.125	0.258	0.015	0.251	0.365	0.352	0.265	0.624 (0.**790**)	
PR (19)	-0.071	-0.037	-0.073	-0.071	-0.123	-0.103	-0.167	-0.142	-0.204	0.213	-0.087	-0.490	-0.075	-0.539	-0.480	-0.555	-0.405	-0.223	0.785 (0.**886**)

Finally, to establish reliability, PLS computes a composite reliability score as part of its integrated model analysis (Table B4). Each reflective construct in our research model demonstrated high levels of reliability that more than meet the standard thresholds.

Table B4. Composite Reliability

Construct (latent variable)	Composite reliability
Disposition to Trust—Benevolence	0.876
Disposition to Trust—Integrity	0.851
Disposition to Trust—Competence	0.884
Disposition to Trust—Trusting Stance	0.912
Institution-Based Trust—Situational Normality—General	0.926
Institution-Based Trust—Situational Normality—Benevolence	0.874
Institution-Based Trust—Situational Normality—Integrity	0.912
Institution-Based Trust—Situational Normality—Competence	0.916
Institution-Based Trust—Situational Normality—Structural Assurance	0.928

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[13] The AVE square roots are represented as the bold and underlined diagonal elements; the preceding number is the AVE. Off-diagonal elements in the table represent the correlations between the constructs. To establish discriminant validity, the diagonal elements must be greater than the off-diagonal elements for the same row and column (Staples et al. 1999).

Construct (latent variable)	Composite reliability
Risk Beliefs	0.894
Seal Assurance	0.926
Trusting Beliefs—Benevolence	0.891
Trusting Beliefs—Integrity	0.918
Trusting Beliefs—Competence	0.924
Intention to Interact—Willingness to Depend	0.950
Intention to Interact—Follow Advice	0.940
Intention to Interact—Give Information	0.869
Intention to Interact—Make Purchase	0.832
Perceived Risk	0.936

Validation of Formative Indicators

Validating formative indicators is more challenging than validating reflective indicators, because the established procedures that exist to determine the validity of reflective measures do not apply to formative measures (Petter et al. 2007c; Straub et al. 2004b), and the procedures validating formative measures are less known and established (Diamantopoulos et al. 2001b). Formative measures are particularly challenging in that they can move in different directions, and they can theoretically covary with other constructs; thus, construct validity and reliability do not apply as easily or as readily, and other procedures must be used than the traditional procedures for convergent and discriminant validity (Marakas et al. 2007; Petter et al. 2007c).

Researchers have generally used theoretical reasoning to support the validity of formative constructs (Diamantopoulos et al. 2001b), although there are approaches that can be used beyond theoretical reasoning alone (Marakas et al. 2007; Petter et al. 2007c). Though no technique is widely established for validating formative measures, the modified multitrait-multimethod (MTMM) approach, as presented in (Loch et al. 2003b; Marakas et al. 2007), is one of two tests that we followed.

For reflective measures, loadings are used because they “represent the influence of individual scale items on reflective constructs; PLS weights represent a comparable influence for formative constructs (Bollen et al. 1991b)” as cited in (Loch et al. 2003b, p. 49). For formative items, we created new values that were the product of the original item values by their respective PLS weights (representing each item’s weighted score). We then created a composite score for each construct by summing all the weighted scores for a construct. We then produced correlations of these values, providing inter-measure and item-to-construct correlations.

To test convergent validity, we checked whether all the items within a construct highly correlate with each other and whether the items within a construct correlate with their construct value[14]. This was true in all cases, inferring convergent validity. While we would ideally want inter-item correlations to be higher within a given construct, this cannot be strictly enforced as there are exceptions depending on the theoretical nature of the formative measure (Diamantopoulos et al. 2001b; Loch et al. 2003b). Also, large matrices will introduce exceptions that are not necessarily meaningful, and thus careful theoretical judgment needs to be used before removing any items (Diamantopoulos et al. 2001b; Loch et al. 2003b; Marakas et al. 2007; Petter et al. 2007c). Thus, we believe the most meaningful discriminant validity check with MTMM and formative measures is to look at the degree to which items within a construct correlate to a given construct. (The MTMM matrixes for formative validity are too large and extensive to fit in these pages and are available by request).

Finally, we used another approach to assess formative validity as suggested by Petter et al. (2007c) that involves testing the multicollinearity among the indicators. This is particularly important with formative indicators because multicollinearity poses a much greater problem than with reflective indicators. Hence, low levels of multicollinearity are usually indicated with levels of the variance inflation factor (VIF) below 10, but in the case of formative indicators, the VIF levels need to be below 3.3 as a more stringent test (Petter et al. 2007c). All of our constructs had VIF levels far below 3.3, with the highest level being 1.19 for the intention to disclose information construct.

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[14] However, a researcher must rely on theory first to deal with any discrepancies.

In sum, using MTMM analysis and assessing VIF levels, we conclude reasonable discriminant validity exists with our formative constructs. Finally, because of the nature of formative measures, reliability checks cannot be reasonably made (Diamantopoulos et al. 2001b).

Given our establishment of factorial validity, we now test the hypotheses.

Testing for Common Methods Bias

To diminish the likelihood of common methods bias in our data collection, the pre-experiment measures were collected approximately two weeks before the experiment was conducted. We also randomized items within the instrument so that participants would be less apt to detect underlying constructs, another potential source of common methods bias (Cook et al. 1979b; Straub et al. 2004b). However, all data was collected using a similar-looking online survey; thus, we still need to test for common methods bias to establish that it is not a likely factor in our data collection. To do so, we used two approaches.

The first approach, which is increasingly in dispute, was to conduct Harman's single factor test (Podsakoff et al. 2003b). This test required that we run an exploratory unrotated factor analysis on all of the first-order constructs. The aim of the test is to see if a single factor emerges that explains the majority of the variance in the model. If so, then common-method bias likely exists on a significant level. The result of our factor analysis produced 23 distinct factors, the largest of which only accounted for 23.6% of the variance of the model.

The second approach, which is more accepted, is simply to examine a correlation matrix of the constructs (see measurement model statistics, next section) and to determine if any of the correlations are above 0.90, which is strong evidence that common methods bias exists (Pavlou et al. 2007b). In no case were the correlations near this threshold.

Given that our data passed both tests of common method bias, we conclude there is little reason to believe that the data exhibit negative effects from common method bias.

Mediation Tests

As a final check, the nature of our model makes it necessary that we check our theorized mediating effects of perceived risks in our model. (Trusting beliefs is another major mediator, but this has been validated in several other studies both theoretically and empirically.) We follow the simple test of mediation proposed by Baron and Kenny[15]. Full mediation occurs when the IV no longer has a significant effect when the mediator is included; partial mediation occurs when the IV still has a significant effect but when its effect is diminished.

Based on these rules, we clearly have potential conditions for mediation with two constructs: perceived risk and brand image. First, the unmediated path between trusting beliefs and intent to disclose starts with a significant β of 0.513 and produces an R^2 of 0.263 for intent to disclose. When the mediation relationship with perceived risk is added, the new paths are significant, the path between trusting beliefs and intent to disclose drops to a β of 0.399, and the R^2 for intent to disclose increases to 0.280. Second, the unmediated path between trusting beliefs and trusting intent starts with a significant β of 0.710 and produces an R^2 of 0.504 for intentions to interact. When the mediation relationship with perceived risk is added, the new paths are significant, the path between trusting beliefs and intentions to interact drops to β of 0.538, and the R^2 for intent to disclose increases to 0.559. Finally, the unmediated path between perceived Web site quality and trusting beliefs has a significant β of 0.577 and produces an R^2 of 0.370 for trusting beliefs. When the mediation relationship with brand image is added, the new paths are significant, the path between trusting beliefs and intent to disclose drops to a β of 0.342, and the R^2 for intent to disclose increases to 0.521. In sum, these results suggest perceived risk and brand image act as partial mediators in our model. Importantly, including these confirms our theoretical model and adds explanatory power to the model.

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[15] "A variable functions as a mediator when it meets the following conditions: variations in levels of the independent variable significantly account for variations in the presumed mediator (i.e., Path a), variations in the mediator significantly account for variations in the dependent variable (i.e., Path b), and when paths a and b are controlled, a previously significant relation between the independent and dependent variables is no longer significant, with the strongest demonstration of mediation occurring when Path c is zero" Baron, R.B., and Kenny, D.A. "The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations," *Journal of Personality and Social Psychology* (51:6) 1986b, pp 1173-1182..

Appendix 4C. Model Analysis

Figure C1 summarizes the testing of the theoretical paths in the model, including all covariates and subconstructs of the second-order formative factors. Variance explained is indicated for each construct as R^2. The path coefficients, or betas (βs), are indicated on the paths between two constructs, along with their direction and significance. The significance of the path estimates was calculated using a bootstrap technique with 200 resamples. Table C1 summarizes the measurement model statistics.

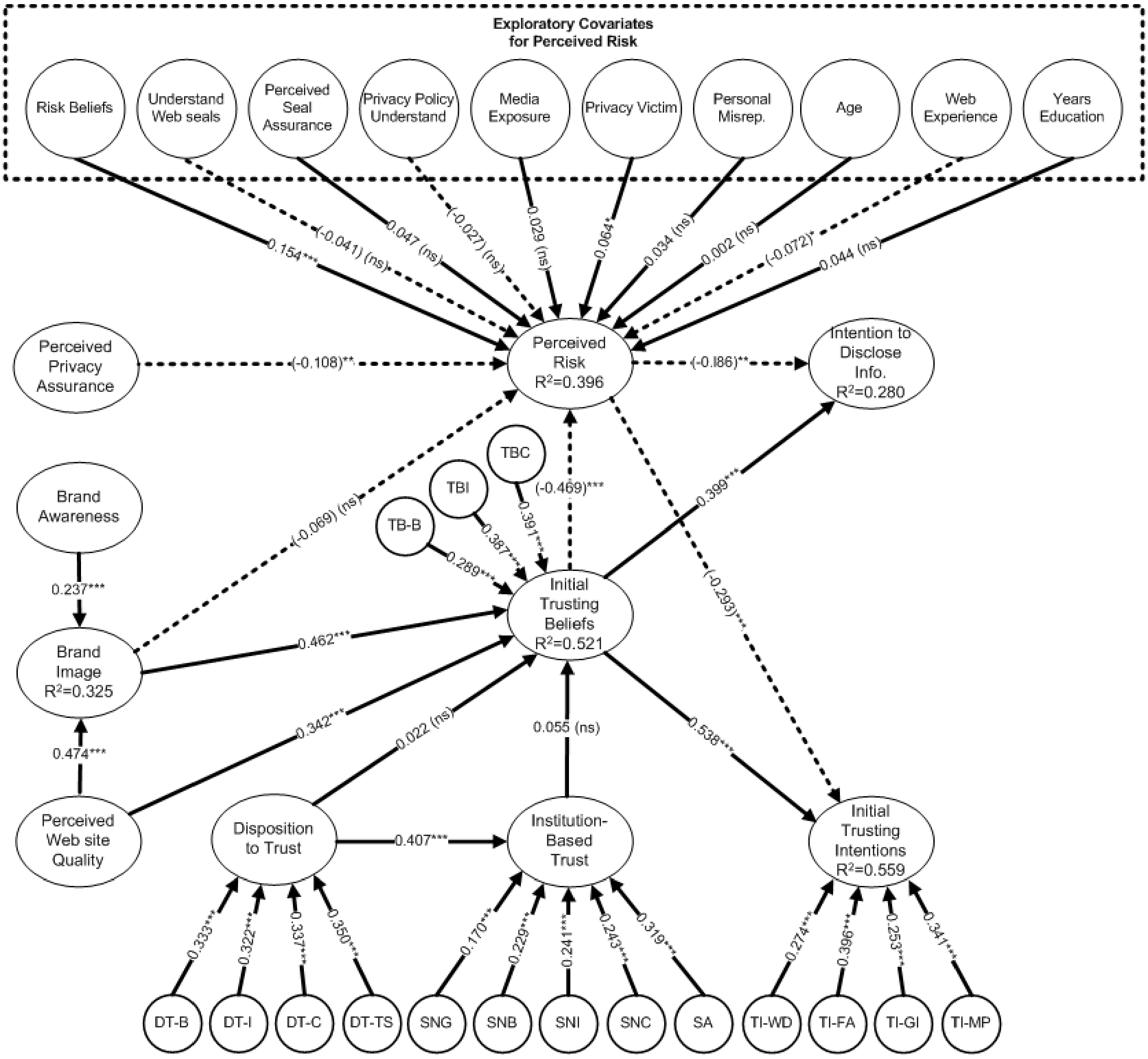
Exploratory Covariates
for Perceived Risk
Risk Beliefs
Understand Web seals
Perceived Seal Assurance
Privacy Policy Understand
Media Exposure
Privacy Victim
Personal Misrep.
Age
Web Experience
Years Education
0.154***
(-0.041) (ns)
0.047 (ns)
(-0.027) (ns)
0.029 (ns)
0.064*
0.034 (ns)
0.002 (ns)
(-0.072)*
0.044 (ns)
Perceived Privacy Assurance
(-0.108)**
Perceived Risk R²=0.396
(-0.186)**
Intention to Disclose Info. R²=0.280
TBC
TBI
TB-B
(-0.469)***
0.391***
0.387***
0.289***
0.399***
(-0.069) (ns)
(-0.293)***
Brand Awareness
0.237***
Brand Image R²=0.325
0.462***
Initial Trusting Beliefs R²=0.521
0.474***
0.342***
0.022 (ns)
0.055 (ns)
0.538***
Perceived Web site Quality
Disposition to Trust
0.407***
Institution-Based Trust
Initial Trusting Intentions R²=0.559
0.333***
0.322***
0.337***
0.350***
0.170***
0.229***
0.241***
0.243***
0.319***
0.274***
0.396***
0.253***
0.341***
DT-B
DT-I
DT-C
DT-TS
SNG
SNB
SNI
SNC
SA
TI-WD
TI-FA
TI-GI
TI-MP

Figure C1. Full Model Analysis with Covariates and Subconstructs

Table C1. Measurement Model Statistics (N = 764)

	μ	SD	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
DT (1)	4.60	0.99									
TI (2)	4.07	1.10	0.319								
Brand (3)	4.39	1.05	0.063	0.137							
Image (4)	4.34	0.98	0.110	0.162	0.307						
TB (5)	4.51	0.99	0.145	0.224	0.086	0.648					
TI (6)	4.03	1.07	0.116	0.175	0.081	0.468	0.653				
PR (7)	3.87	1.27	-0.085	-0.186	-0.020	-0.428	-0.559	-0.534			
WSQ (8)	4.79	1.10	0.127	0.204	0.197	0.483	0.557	0.536	-0.289		
Assure (9)	4.13	1.43	0.101	0.179	0.091	0.291	0.384	0.535	-0.293	0.353	
IDI (10)	3.44	1.01	1.22	0.098	-0.016	0.337	0.469	0.496	-0.336	0.308	0.311

Table C2. Tests of Relevant Covariates

Expected relationship	Path coefficient	t-value	Supported?
Covariate candidate: Risk Beliefs → Perceived Risk	0.154	5.39***	Yes
Covariate candidate: Understanding Web Seals → (-) Perceived Risk	(-0.041)	0.92 (ns)	No
Covariate candidate: Perceived Seal Assurance → (-) Perceived Risk	0.047	1.49 (ns)	No
Covariate candidate: Privacy Policy Understand. → (-) Perceived Risk	(-0.027)	0.82 (ns)	No
Covariate candidate: Media Exposure → Perceived Risk	0.029	0.94 (ns)	No
Covariate candidate: Privacy Victim → Perceived Risk	0.064	2.10*	Yes
Covariate candidate: Personal Misrepresentation → Perceived Risk	0.034	1.07 (ns)	No
Covariate candidate: Age → Perceived Risk	0.002	0.06 (ns)	No
Covariate candidate: Web Experience →(-) Perceived Risk	(-0.072)	2.15*	Yes
Covariate candidate: Years Education → Perceived Risk	0.044	1.19 (ns)	No

Appendix 4D. Modified MTMM Analysis

	V1	V2	V3	V4	V5	V6	GWE	V8	V9	V10	V11	V12	V13	V14	UW	V16	V17	V18	V19	V20	PPU	V22	V23	V24	V25	V26	V27	V28	BRND	V30	V31	V32	V33
V1																																	
V2	0.160																																
V3	-0.133	-0.179																															
V4	-0.061	-0.193	0.562																														
V5	0.073	0.235	-0.267	-0.243																													
V6	-0.116	-0.087	0.187	0.093	-0.178																												
GWE	0.672	0.533	0.102	0.247	0.200	0.339																											
V8	0.015	0.001	0.085	0.063	-0.069	0.049	0.045																										
V9	-0.008	-0.062	0.033	0.038	-0.079	0.002	-0.036	0.439																									
V10	0.051	0.085	-0.088	-0.061	0.066	-0.007	0.061	-0.412	-0.456																								
V11	-0.046	-0.040	0.074	0.065	-0.072	-0.001	-0.039	0.418	0.509	-0.533																							
V12	0.031	0.092	0.014	-0.009	-0.028	0.068	0.088	0.120	0.109	-0.142	0.097																						
V13	-0.028	-0.097	-0.025	0.028	0.031	-0.094	-0.093	-0.336	-0.312	0.320	-0.353	-0.352																					
V14	0.002	0.029	-0.061	-0.048	0.075	-0.034	-0.004	-0.373	-0.488	0.438	-0.556	-0.154	0.370																				
UW	0.015	-0.021	-0.026	0.023	-0.003	-0.047	-0.015	0.119	0.163	0.575	-0.012	-0.170	0.558	0.166																			
V16	-0.006	-0.093	-0.002	0.071	-0.097	-0.068	-0.076	0.046	0.206	-0.169	0.191	-0.107	0.107	-0.167	0.076																		
V17	0.048	0.108	-0.056	-0.037	0.041	-0.041	0.059	-0.190	-0.298	0.295	-0.244	-0.027	0.091	0.263	0.050	-0.362																	
V18	-0.025	0.038	-0.003	-0.019	0.050	0.080	0.043	0.042	-0.046	0.094	-0.090	0.099	-0.017	0.047	0.048	-0.217	0.083																
V19	0.066	0.048	-0.031	-0.047	-0.009	-0.046	0.026	-0.107	0.024	-0.033	-0.001	0.113	-0.151	-0.019	-0.153	0.012	0.110	-0.466															
V20	0.025	0.007	-0.007	0.013	-0.009	-0.047	0.001	-0.199	-0.048	0.053	-0.001	-0.119	0.070	0.052	-0.010	0.222	-0.046	-0.229	0.190														
PPU	0.044	0.112	-0.057	-0.042	0.046	-0.013	0.071	-0.181	-0.237	0.270	-0.225	0.039	0.047	0.218	0.037	-0.232	0.823	0.514	0.105	0.066													
V22	0.066	0.036	-0.032	-0.062	0.047	-0.007	0.044	-0.129	-0.118	0.046	-0.129	0.014	0.037	0.066	-0.077	-0.044	0.137	-0.001	0.027	0.025	0.114												
V23	0.168	0.043	-0.106	-0.086	0.048	-0.059	0.079	-0.116	-0.051	0.113	-0.158	0.036	0.051	0.091	0.023	-0.026	0.084	-0.013	0.043	0.036	0.073	0.527											
V24	0.071	0.000	-0.050	-0.074	-0.010	-0.050	-0.007	-0.092	-0.075	0.083	-0.109	0.000	0.055	0.078	0.010	0.041	0.047	0.007	0.035	0.040	0.065	0.488	0.420										
V25	-0.107	0.028	0.045	0.052	-0.112	0.035	-0.044	0.109	0.065	-0.072	0.093	0.015	-0.037	-0.067	0.010	-0.048	-0.023	0.066	-0.048	-0.043	-0.003	-0.437	-0.461	-0.396									
V26	0.049	-0.074	-0.018	0.031	0.006	-0.068	-0.023	-0.142	-0.037	0.052	-0.033	-0.049	0.088	0.042	0.021	0.092	-0.014	-0.037	0.005	-0.009	-0.020	0.243	0.253	0.308	-0.285								
V27	0.075	-0.040	-0.050	0.020	0.040	-0.056	0.018	-0.142	-0.007	0.096	-0.093	-0.060	0.064	0.059	0.039	0.047	0.054	-0.088	0.032	0.049	0.010	0.371	0.489	0.345	-0.364	0.558							
V28	-0.006	0.045	-0.002	-0.041	0.025	0.053	0.033	0.033	0.034	-0.039	0.010	0.042	-0.013	0.036	-0.004	0.027	-0.047	0.020	-0.008	-0.008	-0.024	0.082	0.111	0.127	-0.282	0.081	0.041						
BRND	0.110	0.012	-0.072	-0.063	0.019	-0.051	0.032	-0.139	-0.059	0.094	-0.133	0.004	0.072	0.097	0.014	0.032	0.064	-0.014	0.033	0.033	0.063	0.644	0.741	0.765	-0.458	0.592	0.685	0.355					
V30	-0.028	0.019	0.004	-0.031	0.066	0.044	0.014	-0.071	-0.015	0.116	-0.027	0.054	0.030	0.028	0.086	0.030	0.040	0.015	0.062	-0.012	0.062	0.206	0.244	0.225	-0.150	0.197	0.202	0.096	0.306				
V31	-0.016	0.036	0.047	0.014	0.060	0.073	0.061	-0.008	-0.067	0.116	-0.098	0.039	0.051	0.040	0.075	-0.041	0.074	0.079	0.036	0.014	0.117	0.180	0.210	0.198	-0.122	0.118	0.142	0.095	0.252	0.721			
V32	0.024	0.024	0.004	0.029	0.053	0.016	0.058	-0.005	0.037	-0.002	-0.009	-0.033	0.020	0.005	0.022	0.035	-0.004	0.018	-0.002	0.029	0.018	0.097	0.070	0.112	-0.055	0.188	0.213	0.051	0.184	0.292	0.308		
V33	0.004	0.026	0.058	0.022	0.030	0.050	0.055	-0.034	-0.010	0.080	-0.027	0.022	0.026	0.018	0.064	-0.034	0.048	0.054	0.017	0.005	0.074	0.189	0.202	0.241	-0.133	0.193	0.193	0.098	0.296	0.589	0.575	0.322	
V34	-0.004	0.037	0.019	-0.036	0.049	-0.014	0.007	0.008	0.001	0.103	-0.045	0.058	-0.011	0.032	0.079	-0.019	0.040	0.043	0.024	0.026	0.068	0.107	0.171	0.160	-0.096	0.057	0.132	0.120	0.204	0.554	0.586	0.320	0.531
IMG	-0.011	0.035	0.034	-0.001	0.068	0.053	0.050	-0.036	-0.023	0.115	-0.057	0.040	0.036	0.034	0.087	-0.007	0.056	0.054	0.042	0.011	0.093	0.213	0.244	0.248	-0.151	0.199	0.225	0.117	0.329	0.880	0.878	0.520	0.774
V36	0.005	-0.008	-0.001	-0.021	0.028	-0.022	-0.012	-0.179	-0.124	0.152	-0.150	-0.030	0.112	0.149	0.043	-0.021	0.062	0.058	0.028	0.055	0.101	0.135	0.140	0.170	-0.110	0.115	0.096	0.020	0.178	0.389	0.398	0.159	0.335
V37	-0.008	-0.005	0.025	-0.006	0.044	0.027	0.013	-0.085	-0.112	0.143	-0.117	-0.003	0.056	0.104	0.048	-0.021	0.071	0.028	0.047	-0.006	0.085	0.132	0.175	0.146	-0.105	0.103	0.147	0.013	0.188	0.391	0.429	0.191	0.343
V38	-0.011	-0.013	0.031	0.010	-0.055	0.022	-0.010	0.185	0.106	-0.126	0.102	0.054	-0.145	-0.123	-0.060	-0.013	-0.006	0.019	-0.006	-0.057	-0.005	-0.091	-0.136	-0.135	0.114	-0.129	-0.144	-0.044	-0.175	-0.244	-0.258	-0.158	-0.303
V39	0.064	0.035	-0.035	-0.007	0.058	-0.026	0.056	-0.173	-0.072	0.116	-0.076	-0.033	0.122	0.092	0.064	0.008	0.033	0.015	0.063	0.080	0.069	0.055	0.101	0.124	-0.052	0.105	0.139	0.035	0.153	0.366	0.355	0.211	0.363
V40	0.038	0.017	-0.058	0.005	-0.007	0.075	0.065	-0.092	-0.090	0.142	-0.140	0.047	0.021	0.083	0.026	-0.025	0.077	0.067	0.047	0.063	0.125	0.081	0.132	0.134	-0.040	-0.008	0.063	-0.011	0.119	0.241	0.284	0.143	0.295
PWQ	0.027	0.008	-0.005	-0.011	0.041	0.010	0.032	-0.151	-0.119	0.166	-0.142	-0.006	0.089	0.129	0.055	-0.022	0.081	0.056	0.064	0.048	0.125	0.128	0.166	0.175	-0.093	0.104	0.139	0.016	0.198	0.462	0.483	0.222	0.413
V42	0.024	0.069	-0.007	-0.054	0.055	-0.043	0.022	-0.028	-0.100	0.073	-0.009	0.040	0.096	0.015	0.072	-0.016	0.052	0.049	-0.046	-0.013	0.056	0.083	0.052	0.118	-0.059	0.024	0.023	0.036	0.092	0.134	0.180	0.102	0.157
V43	-0.028	-0.075	-0.005	0.015	-0.040	0.016	-0.051	0.011	0.106	-0.062	0.030	-0.072	-0.030	-0.040	-0.019	0.034	-0.109	-0.031	0.014	0.040	-0.091	-0.067	-0.017	-0.065	0.059	0.006	0.027	-0.079	-0.048	-0.154	-0.163	-0.119	-0.176
V44	0.041	0.032	0.003	0.027	0.004	-0.017	0.046	0.007	-0.070	0.088	-0.077	0.056	0.070	0.051	0.076	-0.044	0.084	0.010	-0.027	-0.021	0.056	0.060	0.041	0.058	-0.043	-0.026	-0.008	0.060	0.049	0.169	0.199	0.098	0.195
V45	0.064	0.010	-0.034	-0.047	0.040	-0.040	0.019	-0.081	-0.061	0.077	-0.059	0.022	0.123	0.065	0.078	-0.033	-0.010	0.023	-0.022	0.023	-0.001	0.017	0.056	0.075	-0.018	0.131	0.100	0.053	0.119	0.227	0.232	0.136	0.242
V46	0.047	0.027	-0.011	-0.034	0.005	-0.015	0.026	-0.010	-0.080	0.072	-0.024	0.072	0.021	0.045	0.039	-0.063	0.074	0.056	-0.010	-0.039	0.077	0.034	0.017	0.053	-0.056	0.001	-0.026	0.076	0.039	0.139	0.157	0.126	0.158
V47	0.058	0.027	0.013	0.000	-0.026	0.013	0.052	-0.050	-0.090	0.074	-0.064	0.030	0.110	0.103	0.068	-0.040	0.072	-0.003	0.015	-0.019	0.051	0.071	0.082	0.098	-0.051	0.033	0.060	0.052	0.108	0.254	0.261	0.126	0.266
V48	0.021	-0.003	-0.034	-0.018	-0.034	-0.020	-0.013	-0.076	-0.062	0.043	-0.029	0.024	0.033	0.061	0.000	-0.040	0.039	-0.018	-0.024	0.007	0.008	0.048	0.021	0.037	-0.017	0.062	0.091	0.032	0.071	0.236	0.219	0.085	0.212
ASR	0.055	0.009	-0.006	-0.005	-0.031	-0.009	0.028	-0.053	-0.079	0.087	-0.067	0.027	0.117	0.089	0.084	-0.046	0.052	0.000	-0.013	-0.005	0.029	0.070	0.080	0.096	-0.044	0.039	0.078	0.040	0.110	0.260	0.280	0.119	0.267
V50	-0.022	0.008	0.012	0.007	-0.067	0.059	0.005	-0.075	-0.024	-0.001	-0.057	0.019	0.002	0.005	-0.057	-0.035	-0.051	-0.022	0.021	0.080	-0.042	-0.023	-0.043	-0.040	0.032	0.005	-0.016	0.028	-0.025	-0.034	-0.023	-0.109	0.026
V51	0.031	0.020	-0.027	-0.026	-0.022	0.053	0.039	-0.064	-0.057	-0.011	-0.092	-0.008	0.037	0.029	-0.067	-0.047	-0.037	-0.009	-0.005	0.068	-0.033	0.017	-0.031	-0.028	0.001	0.004	0.004	0.013	-0.014	-0.055	-0.002	-0.086	0.012
V52	-0.042	0.001	-0.026	0.008	-0.028	0.059	-0.005	-0.080	-0.031	0.059	-0.090	0.020	0.031	0.042	0.002	-0.004	0.000	0.016	-0.001	0.016	0.012	0.016	0.003	0.000	-0.015	-0.022	0.016	-0.017	-0.005	-0.038	-0.018	-0.072	-0.031
V53	0.017	0.038	-0.005	0.021	-0.039	0.074	0.063	-0.090	-0.071	-0.006	-0.079	0.009	-0.002	0.033	-0.097	-0.054	0.002	0.012	0.013	0.012	0.006	0.010	0.003	-0.032	-0.011	0.014	0.024	0.002	-0.003	-0.052	-0.003	-0.077	-0.002
V54	-0.055	0.002	0.040	0.042	0.055	-0.075	-0.040	0.077	0.053	-0.018	0.095	0.030	-0.030	-0.005	0.054	0.023	0.007	-0.007	-0.009	-0.050	-0.006	-0.032	-0.017	-0.013	0.056	-0.013	-0.008	0.002	-0.012	0.032	0.040	0.045	-0.041
V55	0.075	0.007	-0.008	0.008	0.058	-0.029	0.055	0.018	0.019	-0.007	0.053	-0.013	-0.037	-0.025	0.000	0.034	-0.019	-0.007	0.030	-0.043	-0.013	0.021	0.039	-0.011	0.010	0.047	0.042	-0.019	0.030	0.012	-0.016	0.015	-0.002
V56	-0.009	0.021	0.021	0.048	0.029	-0.034	0.014	-0.004	0.063	0.027	0.110	-0.047	-0.046	-0.054	0.050	0.004	0.022	-0.057	0.045	-0.018	-0.008	-0.026	0.047	-0.005	0.013	0.005	0.040	-0.008	0.021	0.030	0.019	0.030	0.020
V57	-0.064	0.001	0.031	0.015	-0.072	0.045	-0.030	-0.052	-0.032	0.003	-0.047	0.047	0.000	0.017	-0.044	-0.018	-0.012	0.013	-0.047	0.027	-0.013	0.000	-0.047	0.002	0.001	-0.019	-0.019	-0.025	-0.032	-0.014	-0.008	0.026	0.022
V58	0.053	-0.020	0.001	0.020	-0.061	0.035	0.035	0.009	-0.021	0.016	-0.063	-0.015	0.007	0.044	-0.005	0.076	-0.008	-0.022	0.006	0.077	0.006	0.027	-0.040	-0.023	-0.017	-0.031	-0.018	-0.021	-0.040	-0.051	-0.054	-0.013	-0.010
V59	0.026	0.006	-0.030	-0.027	-0.013	0.082	0.043	-0.012	-0.062	-0.028	-0.051	0.039	0.018	0.015	-0.060	-0.010	0.032	-0.045	0.034	0.005	0.005	0.049	0.013	0.022	-0.040	-0.042	-0.023	0.026	0.007	-0.068	-0.047	-0.045	-0.029
V60	-0.004	0.054	-0.037	-0.066	-0.008	0.076	0.031	-0.100	-0.060	0.018	-0.101	0.014	0.020	0.048	-0.066	-0.043	0.014	0.023	-0.004	0.049	0.026	0.019	-0.012	-0.004	0.013	-0.017	-0.024	-0.018	-0.015	0.032	0.074	-0.016	0.067
V61	-0.011	-0.007	-0.061	-0.023	-0.026	0.063	0.001	-0.056	-0.027	0.012	-0.101	-0.030	0.031	0.060	-0.033	-0.055	0.032	0.034	0.030	0.022	0.052	0.053	-0.010	0.054	-0.034	-0.035	-0.017	0.007	0.012	0.003	0.015	0.032	0.049
V62	0.051	0.007	0.033	0.037	0.014	-0.038	0.037	0.056	0.053	-0.022	0.101	0.009	-0.021	-0.041	0.044	0.049	-0.039	-0.045	0.032	0.004	-0.043	-0.016	0.054	-0.027	0.023	-0.009	0.052	-0.011	0.016	0.009	-0.015	-0.045	-0.025
V63	-0.009	0.005	-0.006	0.041	0.053	-0.046	0.002	0.026	0.019	0.024	0.062	-0.012	0.032	-0.002	0.081	-0.002	0.019	-0.002	-0.060	-0.047	-0.011	-0.067	0.021	-0.045	0.048	-0.018	0.017	0.004	-0.014	-0.023	-0.028	-0.003	-0.032
V64	0.054	0.028	-0.046	-0.037	0.045	-0.031	0.029	0.017	0.031	0.000	0.020	-0.039	0.005	0.024	0.032	-0.021	0.028	0.014	0.027	-0.012	0.034	0.021	0.058	-0.030	0.006	0.013	0.030	-0.004	0.021	0.024	-0.006	-0.020	0.021
V65	0.006	0.011	-0.010	-0.021	-0.031	0.014	0.000	-0.050	-0.035	-0.004	-0.086	-0.004	0.022	0.020	-0.052	-0.029	-0.028	-0.020	0.017	0.053	-0.026	0.056	-0.021	0.047	-0.054	0.039	0.030	0.027	0.035	-0.031	-0.010	-0.034	-0.008
V66	-0.021	-0.002	-0.005	0.026	0.050	-0.058	-0.021	0.025	0.070	-0.003	0.091	0.025	-0.017	-0.038	0.058	0.001	0.008	-0.011	0.045	-0.040	0.006	-0.115	-0.008	-0.084	0.080	-0.026	-0.025	-0.042	-0.066	-0.019	0.003	-0.051	-0.021
LID	0.004	0.043	-0.030	-0.031	-0.037	0.093	0.045	-0.105	-0.069	0.005	-0.109	0.023	0.020	0.047	-0.086	-0.049	-0.004	-0.001	0.015	0.058	0.002	0.028	-0.013	-0.015	0.001	-0.013	-0.005	-0.001	-0.011	-0.027	0.014	-0.073	0.033

V34	IMG	V36	V37	V38	V39	V40	PWQ	V42	V43	V44	V45	V46	V47	V48	ASR	V50	V51	V52	V53	V54	V55	V56	V57	V58	V59	V60	V61	V62	V63	V64	V65	V66	LID
0.729																																	
0.281	0.424																																
0.325	0.450	0.540																															
-0.144	-0.296	-0.583	-0.433																														
0.255	0.414	0.633	0.524	-0.738																													
0.253	0.315	0.483	0.388	-0.392	0.388																												
0.370	0.522	0.837	0.848	-0.561	0.784	0.595																											
0.153	0.188	0.219	0.214	-0.189	0.184	0.218	0.250																										
-0.188	-0.201	-0.195	-0.175	0.132	-0.159	-0.214	-0.225	-0.716																									
0.187	0.220	0.216	0.200	-0.145	0.164	0.238	0.247	0.623	-0.806																								
0.193	0.271	0.310	0.220	-0.278	0.305	0.202	0.314	0.432	-0.441	0.440																							
0.169	0.188	0.226	0.166	-0.153	0.158	0.236	0.231	0.612	-0.803	0.763	0.511																						
0.229	0.299	0.298	0.237	-0.218	0.266	0.272	0.326	0.423	-0.535	0.555	0.588	0.578																					
0.167	0.249	0.280	0.245	-0.260	0.263	0.216	0.303	0.390	-0.443	0.455	0.569	0.475	0.646																				
0.222	0.306	0.329	0.276	-0.263	0.287	0.292	0.358	0.558	-0.510	0.674	0.639	0.633	0.915	0.782																			
-0.007	-0.036	0.002	-0.054	-0.025	-0.001	-0.018	-0.033	-0.041	0.028	-0.029	0.017	-0.021	0.027	0.011	0.011																		
-0.032	-0.039	0.067	-0.017	-0.061	0.024	0.053	0.022	-0.021	0.044	-0.003	-0.005	-0.023	0.008	-0.003	0.018	0.690																	
-0.025	-0.044	0.049	0.024	-0.034	0.056	-0.007	0.044	0.012	-0.035	0.040	0.033	0.040	0.066	0.039	0.057	0.419	0.502																
-0.028	-0.039	0.023	-0.006	-0.050	0.022	0.032	0.009	-0.004	-0.009	0.001	-0.005	-0.011	0.008	-0.023	-0.008	0.618	0.653	0.434															
0.014	0.027	-0.033	0.009	0.070	-0.011	0.032	0.007	-0.041	0.028	-0.046	-0.040	-0.037	-0.040	-0.041	-0.055	-0.431	-0.576	-0.435	-0.507														
-0.026	-0.002	-0.047	0.021	0.024	-0.044	-0.044	-0.027	-0.042	0.042	-0.026	-0.012	-0.003	-0.027	-0.055	-0.031	-0.349	-0.287	-0.321	-0.273	0.204													
0.020	0.031	-0.056	-0.016	0.014	-0.003	0.041	-0.021	0.025	0.027	-0.041	-0.057	-0.026	-0.017	-0.066	-0.028	-0.240	-0.321	-0.365	-0.291	0.365	0.426												
0.010	0.003	0.038	0.007	-0.067	0.036	0.050	0.025	0.086	-0.074	0.047	0.082	0.049	0.038	0.079	0.052	0.237	0.169	0.261	0.214	-0.175	-0.694	-0.457											
-0.036	-0.047	-0.004	0.029	-0.042	-0.012	0.015	0.000	0.020	0.000	0.017	0.022	-0.002	-0.011	0.059	0.021	0.136	0.180	0.280	0.214	-0.267	-0.277	-0.369	0.390										
-0.039	-0.062	-0.007	-0.010	-0.002	-0.009	0.030	-0.006	0.007	0.011	-0.005	0.001	-0.028	-0.024	-0.015	-0.017	0.345	0.272	0.243	0.387	-0.204	-0.336	-0.275	0.375	0.296									
0.035	0.054	0.056	0.042	-0.024	0.039	0.027	0.056	-0.050	0.053	-0.058	-0.033	-0.019	-0.018	-0.025	-0.026	0.494	0.605	0.367	0.497	-0.454	-0.124	-0.180	0.007	0.012	0.144								
-0.024	0.020	0.021	-0.001	0.022	0.002	-0.014	0.011	-0.041	0.012	-0.038	0.060	0.019	0.002	0.059	0.002	0.200	0.255	0.278	0.236	-0.298	-0.326	-0.451	0.362	0.289	0.288	0.210							
0.019	-0.013	-0.019	0.002	0.032	0.006	0.034	0.008	-0.007	-0.023	0.047	-0.006	0.024	0.035	-0.027	0.021	-0.197	-0.257	-0.291	-0.228	0.213	0.408	0.417	-0.459	-0.352	-0.341	-0.174	-0.608						
0.002	-0.026	-0.016	-0.012	0.023	-0.014	0.031	-0.007	-0.012	-0.031	0.019	-0.038	-0.009	0.000	-0.025	-0.021	-0.161	-0.257	-0.224	-0.204	0.295	0.183	0.343	-0.198	-0.326	-0.194	-0.283	-0.433	0.407					
0.015	0.010	-0.051	0.027	0.029	-0.002	-0.017	-0.005	-0.011	-0.006	0.021	-0.008	0.033	0.060	0.000	0.043	-0.228	-0.143	-0.205	-0.197	0.099	0.585	0.351	-0.655	-0.309	-0.382	0.039	-0.314	0.394	0.153				
-0.009	-0.025	0.054	0.024	-0.030	0.035	0.007	0.041	-0.029	0.010	-0.008	0.013	-0.035	-0.003	0.023	-0.005	0.503	0.517	0.393	0.478	-0.384	-0.406	-0.450	0.338	0.221	0.382	0.394	0.322	-0.339	-0.272	-0.365			
0.000	-0.021	-0.056	0.005	0.032	-0.025	0.003	-0.022	-0.044	0.045	-0.036	-0.042	-0.039	-0.021	-0.070	-0.039	-0.280	-0.343	-0.289	-0.288	0.339	0.361	0.472	-0.386	-0.424	-0.318	-0.231	-0.443	0.454	0.389	0.386	-0.478		
-0.004	-0.012	0.041	0.014	-0.038	0.033	0.033	0.032	-0.033	0.026	-0.026	0.003	-0.012	0.012	-0.004	0.001	0.783	0.791	0.571	0.781	-0.554	-0.313	-0.348	0.264	0.206	0.497	0.824	0.342	-0.287	-0.302	-0.160	0.622	-0.375	