ELSEVIER

Trust and risk in e-government adoption

France Bélanger [a,*], Lemuria Carter [b]

[a] *Department of Accounting and Information Systems, Virginia Polytechnic Institute and State University, 3007 Pamplin Hall, 0101, Blacksburg, VA 24060, USA*

[b] *Department of Management and Information Systems, Mississippi State University, 302I McCool Hall, 9581, MS State, MS 39762, USA*

Available online 22 January 2008

Abstract

Citizen confidence in government and technology is imperative to the wide-spread adoption of e-government. This study analyzes the impact of trust and risk perceptions on one's willingness to use e-government services. We propose a model of e-government trust composed of disposition to trust, trust of the Internet (TOI), trust of the government (TOG) and perceived risk. Results from a citizen survey indicate that disposition to trust positively affects TOI and TOG, which in turn affect intentions to use an e-government service. TOG also affects negatively perceived risk, which affects use intentions as well. Implications for practice and research are discussed.
© 2008 Elsevier B.V. All rights reserved.

Keywords: E-government; Adoption; Trust; Perceived risk; Disposition to trust; Electronic government

1. Introduction

In the United States, spending on e-government projects is expected to grow 6.9% each year, reaching $5.8 billion by 2009 (Pulliam, 2005). Yet, despite the governments' growing investment in electronic services, citizens are still more likely to use traditional methods, e.g., phone calls or in-person visits, than the Web to interact with the government (Chabrow, 2004). Many citizens may be reluctant to adopt e-government services due to a lack of trust in the security of online transactions and concerns regarding the use of information submitted electronically. These security concerns aren't without merit. Unlike traditional means of interacting with the government, e-services are unique due to the distant and impersonal nature of the Internet (Pavlou, 2003). As technological advancements diffuse through society, fears of identity theft and privacy loss rise (Myron, 2004). In 2003, the Federal Trade Commission (FTC) received 516,740 consumer fraud and identity theft complaints. Of the fraud complaints, 55% were Internet-related, up from 45% in 2002 (Myron, 2004). In light of the inherent uncertainty of using an open technological infrastructure, such as the Internet, citizens want assurance that their online interaction with the government is secure (Pavlou, 2003). While e-government has the potential to improve government transparency, responsiveness, and accountability, e-services will only be adopted if citizens deem them trustworthy.

---

* Corresponding author.

E-mail addresses: Belanger@vt.edu (F. Bélanger), L.Carter@msstate.edu (L. Carter).

The literature identifies trust as an essential element of a relationship when uncertainty, or risk, is present (Mayer et al., 1995; Pavlou, 2003; Siau and Shen, 2003; Warkentin et al., 2002). Numerous studies have explored the role of trust in e-commerce (e.g., Bélanger et al., 2002; Gefen, 2002; Gefen et al., 2003; Hoffman et al., 1999; Jarvenpaa et al., 2000; McKnight and Chervany, 2002; Van Slyke et al., 2004). However, researchers are just beginning to empirically explore the role of trust in e-government adoption (Bélanger and Hiller, 2006; Carter and Bélanger, 2005; Gefen et al., 2005; Welch et al., 2005; Warkentin et al., 2002). Some studies have included trust in broader adoption models, such as the technology acceptance model and the diffusion of innovation theory (Gefen, 2002; Pavlou, 2003; Warkentin et al., 2002), but few, if any, have focused solely on the implications of trust on e-government adoption. In light of citizens' reluctance to switch from traditional means of interacting with government and the need for a better understanding of the impact of trust and risk perceptions on e-government adoption we raise the following question: How does one's perceptions of trust and risk work together to encourage or hinder the adoption of e-government services?

This study proposes a parsimonious yet explanatory model of trust and risk in e-government adoption. The model identifies four fundamental constructs that impact intention to use e-government services: trust of the Internet, trust of the government, disposition to trust, and perceived risk. The model uses Ajzen and Fishbein's (1972) theory of reasoned action (TRA) as a guiding framework. TRA is a popular behavioral model in psychology used to predict human behavior. The model states that beliefs influence intentions and intentions influence one's actions (Ajzen and Fishbein, 1972). Several studies have explored the relationship between trust and user behavior using the TRA (Gefen et al., 2003; Jarvenpaa et al., 2000; McKnight et al., 2002; Pavlou, 2003). In this study, we measure intention-to-use an e-government service. Intention-to-use has been found to be a strong predictor of actual system usage in the IS literature (Chau and Hu, 2001; Venkatesh et al., 2003). As recommended in TRA, we explore several beliefs that may influence intentions to use an e-government service: trust of the Internet, trust of the government, and risk perceptions. Two of these beliefs are predicted to have a positive impact on intention-to-use e-government, while one is predicted to have a negative impact. We include disposition to trust as an antecedent of these beliefs.

2. Conceptual development

Trust has been explored extensively and defined differently in numerous research studies. Due to the diverse definitions of this complex construct we choose to use a well respected and referenced definition of trust. According to Rotter (1971) trust is defined as *an expectancy that the promise of an individual or group can be relied upon*. This definition is rooted in social learning theory which suggests that experiences of promised negative or positive reinforcements vary for different individuals and, as a result, people develop different expectancies that such reinforcements would occur when promised by other people (Rotter, 1971). Rotter's research is referenced in numerous studies of trust (e.g., Gefen et al., 2003; Johnson-George and Swap, 1982; Mayer et al., 1995; McKnight et al., 2002, 1998; Zucker, 1986).

The present study focuses on users' initial trust in an e-government service. Initial trust refers to trust in an unfamiliar trustee. Initial trust is required in a relationship in which the citizen does not yet have credible or meaningful information about the e-service provider (McKnight et al., 2002). In initial relationships people use whatever information they have, such as perceptions of the website or the government agency, to assess the trustworthiness of the trustee (McKnight et al., 2002). During initial encounters, trust is largely based on characteristics of the trustor (their disposition to trust), assumptions made about the traits of the trustee (trust of the government), and institutional factors (trust of the Internet) (Grazioli and Jarvenpaa, 2000).

2.1. Trust of the Internet and trust of the government

It has been suggested that there are two targets of trust: the entity providing the service (party trust) and the mechanism through which it is provided (control trust) (Tan and Theon, 2001). Thus, users should consider both the characteristics of the Web vendor and characteristics of the supporting technological infrastructure before using an electronic-service (Pavlou, 2003). Trust in e-government is therefore composed of the traditional view of trust in a specific entity (trust of the government) as well as trust in the reliability of the enabling technology (trust of the Internet) (Carter and Bélanger, 2005; Pavlou, 2003).

Trust of the Internet (TOI) is consistently identified as a key predictor of e-service adoption (Carter and Bélanger, 2005; McKnight et al., 2002; Pavlou, 2003; Warkentin et al., 2002; Welch et al., 2005). This type of trust is frequently labeled institution-based trust. Institution-based trust refers to *an individual's perceptions of the institutional environment, including the structures and regulations that make an environment feel safe* (McKnight et al., 2002). Zucker (1986) suggests that institution-based trust is one of the most important forms of trust in impersonal financial environments where the sense of a community with shared values is lacking. Pavlou et al. (2003) posit that such a community currently exists on the Internet because of varying cultural norms, expectations and values. The institutional view of trust has been widely adopted by e-commerce and e-government research (Carter and Bélanger, 2005; McKnight et al., 2002; Pavlou, 2003; Warkentin et al., 2002; Welch et al., 2005). Pavlou and Gefen (2004) and McKnight and Chervany (2002) suggest that the popularity of this institutional view may be because e-commerce brings together organizations with little or no familiarity and similarity. According to Shapiro (1987) institution-based trust is basically trust in the Internet: trust in the security measures, safetynets and performance structures of this electronic channel. E-government adoption is contingent upon citizens' belief that the Internet is a dependable medium, capable of providing accurate information and secure transactions.

Trust of the government (TOG) refers to *one's perceptions regarding the integrity and ability of the agency providing the service* (Becerra and Gupta, 1999; Ganesan and Hess, 1997; Jarvenpaa et al., 1998; Lee and Turban, 2001; Mayer et al., 1995; McKnight et al., 2002, 1998). Citizen confidence in the ability of an agency to provide online services is imperative for the widespread adoption of e-government initiatives. Gefen et al. (2005) posit that trust in the agency has a strong impact on the adoption of a technology. Before endorsing e-government initiatives, citizens must believe government agencies possess the astuteness and technical resources necessary to implement and secure these systems. Candid, non-fraudulent interaction with e-government service providers will enhance citizen trust and acceptance of e-government services. On the contrary, unfulfilled promises and dishonesty from government officials and employees will decrease trust and increase opposition to these initiatives.

In e-commerce research, the concepts captured by TOG are frequently addressed by consumer perceptions of a firm's reputation. Reputation refers to the extent to which buyers believe an organization is honest and concerned about its customers (Doney and Cannon, 1997; Jarvenpaa et al., 2000). Firms with a good reputation are perceived to be reluctant to jeopardize their reputational assets by acting opportunistically (Barclay and Smith, 1997; Chiles and McMackin, 1996; Ruyter et al., 2001). For instance, many people refer to the government as "big brother," a ubiquitous presence that infringes upon constituents' personal lives. Since technology enables expedited collection and advanced analysis of data, users of e-government services want to engage in transactions with agencies that will protect and respect their private data. Citizens must believe that government agencies provide e-government services for the purpose of benefiting, not monitoring, society.

2.2. Disposition to trust

Disposition to trust is defined as *one's general propensity to trust others*. It is composed of two concepts: faith in humanity and trusting stance. Faith in humanity assumes others are good-natured and dependable. Trusting stance assumes better outcomes result from dealing with people as if they are well meaning and reliable (McKnight et al., 2002). Therefore, trust is the result of psychological dispositions that are beyond the immediate control of any government agency. These perennial propensities deal with the life-long socialized tendency to believe in social entities and to believe that better results will occur if one trusts others (McKnight et al., 1998; Rotter, 1971; Warkentin et al., 2002).

Disposition to trust is sometimes referred to as personality-based trust because it refers to one's general tendency to believe or not to believe in others (Gefen et al., 2003; Mayer et al., 1995). This disposition is especially important in the initial phases of a relationship (McKnight et al., 1998; Rotter, 1971). Although e-government initiatives are growing in popularity, e-government is still in its infancy. Citizens are just beginning to acquire more meaningful information about the benefits and consequences of completing transactions with the government online. Hence, one's general propensity to trust will have an impact on e-government adoption through its influence on trust of the Internet and trust of the government.
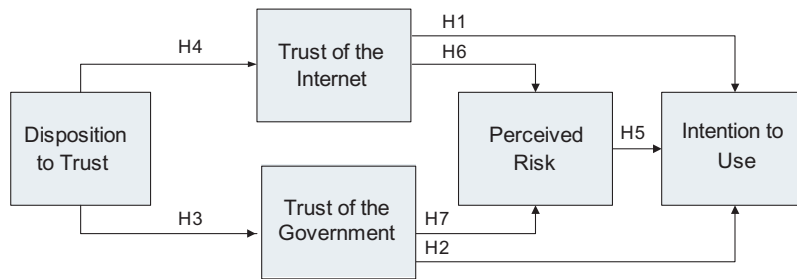
Fig. 1. Trust and risk in e-government adoption.

2.3. Perceived risk

Risk is typically defined in terms of the trustor's belief about the likelihood of gains and losses (Mayer et al., 1995; Pavlou, 2003; Warkentin et al., 2002). When risk is present, trust is mandatory (Corritore et al., 2003; Mayer et al., 1995; Pavlou, 2003). Pavlou (2003) found trust to be a significant antecedent of perceived risk. Perceived risk decreases when trust is present (Featherman and Pavlou, 2003; Ganesan, 1994; Grazioli and Jarvenpaa, 2000; Jarvenpaa et al., 2000).

Since risk is difficult to measure objectively, the literature focuses on users' risk perceptions. Perceived risk is defined as *the citizen's subjective expectation of suffering a loss in pursuit of a desired outcome* (Warkentin et al., 2002). Perceived risk is composed of behavioral and environmental uncertainty. Behavioral uncertainty exists because online service providers may behave in an opportunistic manner by taking advantage of the impersonal nature of the electronic environment, while environmental uncertainty arises due to the unpredictable nature of Internet-based technology that is beyond the control of the consumer (Pavlou, 2003). In e-commerce perceived risk reduces users' intentions to exchange information and complete transactions (Pavlou, 2003). Warkentin et al. (2002) suggest that perceived risk will have a synonymous effect on e-government. In addition to the relationship between risk and intention, research shows that trust reduces risk perceptions (Salam et al., 2003). The e-service adoption literature (Pavlou, 2003; Schlosser et al., 2006; Sitkin and Pablo, 1992) also suggests that perceived risk mediates the effect of trust on intention.

2.4. Model of trust and risk in e-government adoption

Based on the aforementioned literature we propose the following model of trust in e-government adoption (see Fig. 1). Hypotheses derived from the model are summarized below.

H1: Trust of the Internet (TOI) will positively influence citizen intention to use (USE) an e-government service.
H2: Trust of the government (TOG) will positively influence citizen intention to use (USE) an e-government service.
H3: Disposition to trust (DT) will positively influence trust of the government (TOG).
H4: Disposition to trust (DT) will positively influence trust of the Internet (TOI).
H5: Perceived risk (PR) will negatively influence intentions to use (USE) an e-government service.
H6: Higher trust of the Internet (TOI) will reduce the perceived risk (PR) of using an e-government service.
H7: Higher trust of the government (TOG) will reduce the perceived risk (PR) of using an e-government service.

3. Methodology

Studies of technology adoption have traditionally been conducted using survey research (Venkatesh et al., 2003). Consequently, this study surveyed a diverse group of citizens to obtain their perceptions of e-government services. The results were analyzed using structural equation modeling (SEM) in Amos 6.

3.1. Instrument development

The development of the survey was patterned after the process used by Moore and Benbasat (1991). Questions were compiled from validated instruments in the literature to represent each construct, and wording was modified to fit the e-government context. Items were adapted from previous studies of use intentions (USE) (Carter and Bélanger, 2005; Gefen, 2000; Pavlou, 2003), trust (TOI, TOG, DT) (McKnight et al., 2002; Pavlou, 2003; Van Slyke et al., 2004), and perceived risk (PR) (Pavlou, 2003). Each item is rated on a scale of 1–7 (Strongly Disagree to Neutral to Strongly Agree). The final items are provided in the Appendix.

To increase generalizability, two versions of the survey were created. One referred to the Department of Motor Vehicles (DMV) and the other to the Department of Taxation (VA Tax), both services being offered online. Reference to a specific agency provided the participants with a reference point in providing their answers. Subsequent tests revealed no statistical differences between the respondents of each of these e-services.

Doctoral students pre-tested the instrument, identifying ambiguous or poorly worded items. The instrument was then pilot tested with undergraduate students at a large university. Constructs in the pilot test showed internal consistency levels ranging from .80 to .86, which exceeds the 0.70 alpha value suggested by (Nunnally, 1978). The final survey included the five scales, as well as demographic and self-reported usage items described below.

3.2. Sample

To obtain study participants a paper-based survey was administered in two different settings: a community concert and an undergraduate class at a southeastern university. As tested by an ANOVA, there was no significant difference in intention to use an e-government service for the two groups. Since the two groups did not exhibit a significant difference in their perceptions of the dependent variable (intention to use) we used a combined sample in the data analysis.

Overall, the instrument was administered to 243 citizens. Of the 243 surveys administered, 214 were complete and used in the analysis. Forty-nine percent of the subjects were female. Ninety-two percent of the sample has purchased an item or service online. Eighty-five percent use the Internet to gather information about the government. Fifty-nine percent have completed a transaction with the government online. Individuals in the sample had an average of 10 years experience using a computer. Age range was 14–83 years old, computer experience range was from 0 to 28 years of usage, and years of work experience ranged from 0 to 40 years.

3.3. Data analysis

In previous studies, frequency of Internet usage and frequency of Internet shopping had significant impacts on use intentions (Carter and Bélanger, 2005; Jarvenpaa et al., 2000). Therefore, we first ran a multiple regression with these variables on use intentions as the dependent variable. None of the variables was significant, so we did not include them in the structural model. χ^2 tests also revealed no statistical differences between respondents for the DMV and VA Tax versions of the survey.

The research model was then tested using structural equation modeling (SEM) techniques, which is a comprehensive approach to testing hypotheses about relations among observed and latent variables (Hoyle, 1995), and can be used for either predictive applications or theory testing. The statistical approach incorporates path analysis, factor analysis, and linear regression into a theoretical causal model for analysis of latent constructs and measurable variables, allowing simultaneous estimation of both measurement and structural sub-models (Anderson and Gerbing, 1988). Specifically, confirmatory factor analysis of multi-item scales and the estimation of fit indices for the structural models were performed with the AMOS 6.0 software package. Each response item was allowed to load only on its associated latent variable. Seven point Likert-type scales were used for the measurement of each item. West et al. (1995) consider it essential to use more than three values for measurement of each item in order to treat items as continuous variables in the AMOS analysis. Thus, response items were assumed for analysis purposes to be measured on continuous scales. AMOS models were estimated with a covariance matrix and the maximum-likelihood estimation method. This estimation method

has been shown to provide good parameter estimates even if the data deviates from a normal distribution (Chou and Bentler, 1996).

4. Results

4.1. Descriptive statistics

Means, standard deviations, and ranges for the variables are reported in Table 1. In order to compute descriptive statistics, multiple-item scales were averaged. Squared pairwise correlations between latent variables, computed with AMOS, are reported in Table 2. Cronbach's alpha estimates are reported on the main diagonal of the table. Each alpha exceeds the recommended minimum acceptable level of 0.70 (Nunnally, 1978).

4.2. Measurement model

Convergent and discriminant validity of the scales were tested with confirmatory factor analysis. Convergent validity is assessed with three ad hoc tests recommended by Anderson and Gerbing (1988). Table 3 lists the standardized loadings, composite reliabilities, and variance-extracted estimates. Standardized factor loadings are indicative of the degree of association between scale items and a single latent variable. The loadings are highly significant. Composite reliabilities, similar to Cronbach's alpha, range from 0.83 to 0.88, well exceeding the minimum limit of 0.70. Variance-extracted estimates are measures of the variation explained by the latent variable to random measurement error (Netemeyer et al., 1990) and ranged from 0.51 to 0.72. These estimates exceed the recommended lower limit of 0.50 (Fornell and Larcker, 1981). All tests support the convergent validity of the scales.

Discriminant validity was assessed with the test recommended by Anderson and Gerbing (1988). The squared correlation between a pair of latent variables (Table 2) should be less than the variance extracted estimate of each variable (Table 3). Every combination of latent variables was tested, and each pairing passed, providing evidence of the discriminant validity of the scales.

4.3. Structural model testing

The overall model fit is adequate, as can be seen from Table 4. The test of overall model fit resulted in a χ^2 value of 341.23 with 141 degrees of freedom and a probability value of less than .001. The p-value being sig-

Table 1
Means, standard deviations, and ranges ($n = 214$)

Variable	Min	Max	Mean	Std. Dev.
Use intentions	1.00	7.00	5.04	1.13
Trust of the Internet	1.00	7.00	4.56	1.22
Trust of the government	1.00	7.00	4.62	1.11
Disposition to trust	1.00	6.80	4.67	1.00
Perceived risk	1.00	6.75	4.45	0.89

Table 2
Squared pairwise correlations and alpha internal reliabilities

Variable	USE	TOI	TOG	DT	PR
Use intentions (USE)	**0.86**[a]				
Trust of the Internet (TOI)	.498[b]	**0.83**[a]			
Trust of the government (TOG)	.512 [b]	.609 [b]	**0.88**[a]		
Disposition to trust (DT)	.199 [b]	.381[b]	.432 [b]	**0.80**[a]	
Perceived risk (PR)	.527[b]	.490[b]	.351[b]	.121	**0.83**[a]

[a] Cronbach's alpha are shown on the main diagonal.
[b] Significant at $p < 0.01$.

Table 3
Results of confirmatory factor analysis

Construct items	Std. loading	Comp. reliability	Variance extracted estimate
Use intentions		0.877	0.640
Use1	0.791		
Use2	0.819		
Use3	0.797		
Use4	0.793		
Trust of the Internet		0.828	0.616
TOI1	0.794		
TOI2	0.803		
TOI3	0.756		
Trust of the government		0.883	0.653
TOG1	0.806		
TOG 2	0.845		
TOG 3	0.795		
TOG 4	0.786		
Disposition to trust		0.806	0.510
DT1	0.667		
DT3	0.682		
DT4	0.788		
DT5	0.714		
Perceived risk		0.840	0.724
PR1	0.879		
PR3	0.822		

Table 4
Model fit summary for the proposed research model

Fit index	Model	Recommendation
χ^2	341.23	n/a
Degrees of freedom	141	n/a
P	<0.001	Non significant
χ^2/df	2.42	<3.00
GFI	.85	>.90
AGFI	.82	>.80
Comparative fit index (CFI)	.90	>.90
Tucker-Lewis Index (TLI)	.89	>.95
Root mean square error of approximation (RMSEA)	.08	<.10

nificant indicates the absolute fit of the model is less than desirable. However, because the χ^2 test of absolute model fit is sensitive to sample size and non-normality, a better measure of fit is χ^2 over degrees of freedom. This ratio for our model is within the suggested 3 to 1 bracket (Chin and Todd, 1995; Gefen, 2000).

Typically, researchers also report a number of fit statistics to assess the relative fit of the data to the model. Descriptive fit statistics compare a specified model to a baseline model, typically the independence model, in an attempt to demonstrate the superiority of the proposed model. Jaccard and Wan (1996) recommend the use of at least three fit tests. We report Goodness-of-fit index (GFI), the adjusted GFI (for sample size) (AGFI), the Tucker-Lewis Index (TLI), and the Comparative Fit Index (CFI). The GFI, TLI and the CFI compare the absolute fit of a specified model to the absolute fit of the independence model. The greater the discrepancy between the overall fit of the two models, the larger the values of these descriptive statistics. Research by Gerbing and Anderson (1992) identifies the CFI as one of the most stable and robust fit indices. We also report RMSEA (Root Mean Square Error of Approximation), which measures the discrepancy per degree of freedom (Steiger and Lind, 1980).

Table 5
Path coefficients and hypothesis testing

	Relationship	Coefficients	p-Value	Supported
H1	TOI → USE	.29	<.001	YES
H2	TOG → USE	.42	<.001	YES
H3	DT → TOI	.66	<.001	YES
H4	DT → TOG	.67	<.001	YES
H5	PR → USE	.22	<.001	NO [a]
H6	TOI → PR	.13	.190	NO
H7	TOG → PR	−.28	<.005	YES

[a] The path is significant. However, the hypothesis is not supported since the sign of the coefficient is in the opposite direction of the prediction.
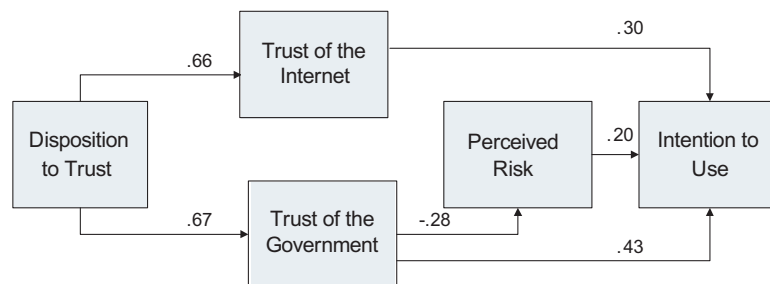

Fig. 2. Significant relationships.

The GFI should be at or above 0.90 (Hoyle, 1995), while the AGFI should be at or above 0.80 (Chin and Todd, 1995; Segars and Grover, 1993). The CFI statistic should be at or above 0.90 (Bentler and Bonett, 1980; Hoyle, 1995), but a CFI above 0.95 is considered to be an exceptional fit (Bentler and Bonett, 1980; Hoyle, 1995). TLI is more restrictive, and requires a value of 0.95 or above (Hu and Bentler, 1999). Finally, RMSEA should be below 0.10 (Browne and Cudeck, 1993), but has also been suggested to represent a very good fit if below the more restrictive threshold of 0.08.

Having established the relative adequacy of the model's fit, it is appropriate to examine individual path coefficients corresponding to our hypotheses. This analysis is presented in Table 5. Five of the seven hypotheses are supported. Trust of the Internet and trust of the government positively influence intention to use (H1 and H2). Disposition to trust positively influences trust of the Internet and trust of the government (H3 and H4). Trust of the government reduces the perceived risk of using e-government services (H7). Hypotheses 5 and 6 are not supported. Higher levels of perceived risk did not decrease intention to use, and trust of the Internet did not affect risk perceptions.

Fig. 2 shows the path coefficients for each significant relationship. The only predicted path that is not significant is that between trust of the Internet and perceived risk. With the exception of the relationship between perceived risk and intention to use, the signs of the coefficients are in the predicted direction.

5. Discussion

Institution-based trust, or trust in the Internet, is an essential element of e-government adoption. Citizens must believe that mechanisms are in place to ensure secure and private data transmission over such an impersonal medium. Government agencies should take advantage of trust-building mechanisms used by e-commerce vendors, such as posting security and privacy seals, to encourage adoption of e-government services. Agencies should also use pamphlets and posters at their brick-and-mortar locations to emphasize the security and privacy mechanisms employed to ensure reliable services.

Trust of the government agency providing the service is also important to e-government adoption. Agencies need to communicate their ability and desire to provide citizens with convenient, dependable service via a

plethora of channels, including the Internet. Government agencies should publicize stories of e-services that are successful and statistics of citizens who are pleased with these services. Such publicity would positively impact citizens' perceptions of the competence of government agencies. The American Customer Satisfaction Index (ACSI) is one means of measuring and highlighting citizen satisfaction with e-government services. This index reflects overall satisfaction and the likelihood of desirable future behaviors, such as repeat visits. Each year more federal websites including the Department of Treasury, Central Intelligence Agency, and the Department of Transportation, measure their performance using the ACSI (Freed, 2003). Research has shown that users of government websites have an exceptionally high propensity to recommend the site to others (Freed, 2003). Such positive publicity will help to increase non-adopters' perceptions of the agency's trustworthiness. This has two effects, increasing their intention to use e-government services, and decreasing their perceptions of risk affiliated with adopting these services.

Disposition to trust is a personal propensity which government agencies cannot manipulate. However, e-government service providers should be aware of its existence and its impact on other, more pliable modes of trust, such as trust of the Internet and trust of the government. By nature, some constituents will be more reluctant and skeptical to use e-government services than others. Citizens with a lower propensity to trust, however, may represent the biggest opportunity for growth in e-government adoption. Government agencies should make an effort to reach this group of suspicious citizens to realize the greatest return on their IT investment. Agencies could provide incentives to encourage citizens to try e-government services. Perhaps an agency could guarantee online processing would be faster than face-to-face or telephone transactions. Once a citizen has a successful experience with these services he will begin to develop trust in the Internet and the government which, in turn, may increase his willingness to use e-government services in the future.

Interestingly, higher levels of trust of the Internet did not decrease citizens' risk perceptions, nor did risk perceptions decrease citizens' intention to use an e-government service. This finding is incongruent with the e-commerce literature. However, there are differences between commercial businesses and government agencies. E-commerce and e-government differ in their reasons for existence (profit vs. service) and constituents served (target market vs. population at-large). Citizens perceive businesses differently than government. Perhaps the perception of risk in e-commerce is more prevalent than in e-government. Or, perhaps different trust constructs impact risk in e-government. Future research should address these potential differences.

This study has various practical implications for government service providers. It highlights the importance of citizens' trust in both the agency and the technology used to provide electronic services. Hence, government agencies should first emphasize their general competence in their particular areas of expertise, and then highlight their ability to provide their services via the Internet. In the private sector, businesses have acknowledged the importance of trust and risk perceptions. E-commerce firms post trust seals, promote privacy policies, and emphasize security features. It is imperative government agencies acquire and advertise features that increase citizens' perceptions of the site's trustworthiness as well. They could also provide trust and privacy seals on their websites and promote their reputation via online testimonials. Collaborating with well-respected businesses in the private sector is also an avenue to increase citizens' perceptions.

Future research is needed to determine if there are additional trust constructs unique to e-government adoption. For example, given that over half of the respondents had experience using e-government services, it would be interesting to compare their perceptions of trust to their actual use of e-services. The differences between government-to-citizen interaction and business-to-consumer interaction may result in additional factors that aren't present in e-commerce. Future studies should also explore the antecedents of each construct to expand the explanatory power of the model. This model can also be used to study trust in specific e-government systems, such as e-voting systems. Trust and risk are integral concepts of e-voting adoption. This model provides a means of eliciting citizen perceptions of the risk involved and trust required to encourage acceptance of Internet-based technology in the public sector.

6. Conclusion

This study integrates disposition to trust, trust of the Internet, trust of the government and perceived risk in a model of e-government adoption. This model represents a step toward identifying the unique elements of trust in e-government. Research reports repeatedly show that a lack of trust hinders citizen adoption of e-gov-

ernment services. As government agencies increase spending to implement and maintain these initiatives, it is imperative that they also acknowledge and address e-government trust issues. In addition to technical staff and software, government agencies should also budget trust-building strategies into their fiscal plan.

As technology continues to become ingrained in society, citizens' perceptions of the accuracy and reliability of e-services will increase in importance. If government agencies expect citizens to provide sensitive information and complete personal transactions online, they must acknowledge and enhance citizens' views concerning the credibility of e-government services.

Appendix A. Description of final survey items

Use intentions
    Use1 I would use the Web for gathering state government information
    Use2 I would use state government services provided over the We
    Use3 Interacting with the state government over the Web is something that I would do
    Use4 I would not hesitate to provide information to a state government Website

Trust of the Internet
    TOI1 The Internet has enough safeguards to make me feel comfortable using it to transact personal business with state government agencies
    TOI2 I feel assured that legal and technological structures adequately protect me from problems on the Internet
    TOI3 In general, the Internet is now a robust and safe environment in which to transact with state government agencies

Trust of the government
    TOG1 I think I can trust state government agencies
    TOG2 State government agencies can be trusted to carry out online transactions faithfully
    TOG3 I trust state government agencies keep my best interests in mind
    TOG4 In my opinion, state government agencies are trustworthy

Disposition to trust
    DT1 I generally do not trust other people
    DT3 I generally have faith in humanity
    DT4 I feel that people are generally reliable
    DT5 I generally trust other people unless they give me reason not to

Perceived risk
    PR1 The decision of whether to use a state e-government service is risky
    PR3 In general, I believe using state government services over the Internet is risky

References

Ajzen, I., Fishbein, M., 1972. Attitudes and normative beliefs as factors influencing intentions. Journal of Personality and Social Psychology 21 (1), 1–9.

Anderson, J.C., Gerbing, D.W., 1988. Structural equation modeling in practice: a review and recommended two-step approach. Psychological Bulletin 103 (3), 411–423.

Barclay, D.W., Smith, J.B., 1997. The effects of organizational differences and trust on the effectiveness of selling partner relationships. Journal of Marketing 61 (1), 3–21.

Becerra, M., Gupta, A.K., 1999. Trust within the organization: integrating the trust literature with agency theory and transaction costs economics. Public Administration Quarterly 23 (2), 177–203.

Bélanger, F., Hiller, J., 2006. A framework for e-government: privacy implications. Business Process Management Journal 12 (1), 48–60.

Bélanger, F., Hiller, J., Smith, W.J., 2002. Trustworthiness in electronic commerce: the role of privacy, security, and site attributes. Journal of Strategic Information Systems 11 (3/4), 245–270.

Bentler, P., Bonett, D., 1980. Significance tests and goodness of fit in the analysis of covariance structures. Psychological Bulletin 88 (3), 588–606.

Browne, M.W., Cudeck, R., 1993. Alternative ways of assessing model fit. In: Bollen, K.A., Long, S. (Eds.), Testing Structural Equation Models. Sage, Newbury Park, CA, pp. 136–162.

Carter, L., Bélanger, F., 2005. The utilization of e-government services: citizen trust, innovation and acceptance factors. Information Systems Journal 15 (1), 5–25.

Chabrow, E., 2004. Survey Says Citizens Want More Than E-government. Retrieved June 01, 2005 from <http://www.information-week.com/story/showArticle.jhtml?articleID=21100103/>.

Chau, P.Y.K., Hu, P.J.-H., 2001. Information technology acceptance by individual professionals: a model comparison approach. Decision Sciences 32 (4), 699–719.

Chiles, T.H., McMackin, J.F., 1996. Integrating variable risk preferences, trust, and transaction cost economics. Academy of Management. The Academy of Management Review 21 (1), 73–99.

Chin, W.W., Todd, P.A., 1995. On the use, usefulness, and ease of use of structural equation modeling in MIS research: a note of caution. MIS Quarterly 19 (2), 237–246.

Chou, C., Bentler, P., 1996. Application of AIC with the Wald and Lagrange multiplier statistics: model modification in covariance structure analysis. Multivariate Behavioral Research 31 (3), 351–370.

Corritore, C.L., Kracher, B., Wiedenbeck, S., 2003. On-line trust: concepts, evolving themes, a model. International Journal of Human–Computer Studies 58 (6), 737–758.

Doney, P.M., Cannon, J.P., 1997. An examination of the nature of trust in buyer-seller relationships. Journal of Marketing 61 (2), 35–51.

Featherman, M.S., Pavlou, P.A., 2003. Predicting e-service adoption: a perceived risk facets perspective. International Journal of Human–Computer Studies 59, 451–474.

Fornell, C., Larcker, D.F., 1981. Evaluating structural equation models with unobservable variables and measurement error. Journal of Marketing Research 18 (1), 39–50.

Freed, L., 2003. American customer satisfaction index e-government satisfaction index: ForeSee Results. Retrieved September 27, 2003 from <http://www.foreseeresults.com/WhitePapers/eGovBench.pdf/>.

Ganesan, S., 1994. Determinants of long-term orientation in buyer-seller relationships. Journal of Marketing 58 (2), 1–19.

Ganesan, S., Hess, R., 1997. Dimensions and levels of trust: implications for commitment to a relationship. Marketing Letters 8 (4), 439–448.

Gefen, D., 2000. E-commerce: the role of familiarity and trust. Omega: The International Journal of Management Science 28 (6), 725–737.

Gefen, D., 2002. Reflections on the dimensions of trust and trustworthiness among online consumers. Database for Advances in Information Systems 33 (3), 38–53.

Gefen, D., Rose, Gregory M., Warkentin, Merrill, Pavlou, Paul A., 2005. Cultural diversity and trust in IT adoption: a comparison of USA and South African e-voters. Journal of Global Information Management 13 (1), 54–78.

Gefen, D., Karahanna, E., Straub, D.W., 2003. Trust and TAM in online shopping: an integrated model. MIS Quarterly 27 (1), 51–90.

Gerbing, D.A., Anderson, J.C., 1992. Monte Carlo evaluations of goodness of fit indices for structural equation models. Sociological Methods and Research 2 (2), 132–160.

Grazioli, S., Jarvenpaa, S.L., 2000. Perils of internet fraud: an empirical investigation of deception and trust with experienced internet consumers. IEEE Transactions on Systems, Man, and Cybernetics-Part A: Systems and Humans 30 (4), 395–410.

Hoffman, D., Novak, T.P., Peralta, M., 1999. Building consumer trust online. Communications of the ACM 42 (4), 80–85.

Hoyle, R.H., 1995. The Structural Equation Modeling Approach: Basic Concepts and Fundamental Issues. Sage, Thousand Oaks, CA.

Hu, L.-t., Bentler, P.M., 1999. Cutoff criteria for fit indexes in covariance structure analysis: conventional versus new alternatives. Structural Equation Modeling 6 (1), 1–55.

Jaccard, J., Wan, C.K., 1996. LISREL approaches to interaction effects in multiple regression. Sage, Thousand Oaks, CA.

Jarvenpaa, S.L., Knoll, K., Leidner, D.E., 1998. Is anybody out there? Antecedents of trust in global virtual teams. Journal of Management Information Systems 14 (4), 29–64.

Jarvenpaa, S.L., Tractinsky, N., Vitale, M., 2000. Consumer trust in an internet store. Information Technology and Management 1 (1), 45–71.

Johnson-George, C., Swap, W., 1982. Measurement of specific interpersonal trust: construction and validation of a scale to assess trust in a specific other. Journal of Personality and Social Psychology 43 (6), 1307–1317.

Lee, M.K.O., Turban, E., 2001. A trust model for consumer internet shopping. International Journal of Electronic Commerce 6 (1), 75–91.

Mayer, R.C., Davis, J.H., Schoorman, F.D., 1995. An integrative model of organizational trust. Academy of Management Review 20 (3), 709–734.

McKnight, D.H., Chervany, N.L., 2002. What trust means in e-commerce customer relationships: an interdisciplinary conceptual typology. International Journal of Electronic Commerce 6 (2), 35–59.

McKnight, D.H., Choudhury, V., Kacmar, C., 2002. Developing and validating trust measures for e-commerce: an integrative approach. Information Systems Research 13 (3), 334–359.

McKnight, D.H., Cummings, L.L., Chervany, N.L., 1998. Initial trust formation in new organizational relationships. Academy of Management Review 23 (3), 473–490.

Moore, G., Benbasat, I., 1991. Development of an instrument to measure the perceptions of adopting an information technology innovation. Information Systems Research 2 (3), 192–222.

Myron, D., 2004. Stolen names, big numbers. American Demographics 26 (7), 36.

Netemeyer, R.G., Johnston, M.W., Burton, S., 1990. Analysis of role conflict and role ambiguity in a structural equations framework. Journal of Applied Psychology 75 (2), 148–157.

Nunnally, J., 1978. Psychometric Theory. McGraw-Hill, New York, NY.

Pavlou, P., 2003. Consumer acceptance of electronic commerce: integrating trust and risk with the technology acceptance model. International Journal of Electronic Commerce 7 (3), 69–103.

Pavlou, P., Tan, Y.-H., Gefen, D., 2003. Institutional trust and familiarity in online interorganizational relationships. Paper presented at the Proceedings of the eleventh European Conference on Information Systems, June 16–21, Napels, Italy.

Pavlou, P.A., Gefen, D., 2004. Building effective online marketplaces with institution-based trust. Information Systems Research 15 (1), 37–59.

Pulliam, D., 2005. E-gov Spending Expected to Rise, Despite Congressional Dissatisfaction. Retrieved March 24, 2006, from <http://www.govexec.com/dailyfed/1204/010605p1.htm/>.

Rotter, L.B., 1971. Generalized expectations for interpersonal trust. American Psychologist 26 (5), 443–452.

Ruyter, K.d., Wetzels, M., Kleijnen, M., 2001. Customer adoption of e-service: an experimental study. International Journal of Service Industry Management 12 (2), 184–207.

Salam, A.F., Rao, H.R., Pegels, C.C., 2003. Consumer-perceived risk in e-commerce transactions. Communications of the ACM 46 (12), 325–331.

Schlosser, A.E., White, T.B., Lloyd, S.M., 2006. Converting website visitors into buyers: how website investment increases consumer trusting beliefs and online purchase intentions. Journal of Marketing 70, 133–148.

Segars, A.H., Grover, V., 1993. Re-examining perceived ease of use and usefulness: a confirmatory factor analysis. MIS Quarterly 17 (4), 517–525.

Shapiro, S.P., 1987. The social control of impersonal trust. American Journal of Sociology 93 (3), 623–658.

Siau, K., Shen, Z., 2003. Building customer trust in mobile commerce. Communications of the ACM 46 (4), 91–94.

Sitkin, S.B., Pablo, A.L., 1992. Reconceptualizing the determinants of risk behavior. Academy of Management Review 17 (1), 9–38.

Steiger, J.H., Lind, J.C. 1980. Statistically-based tests for the number of common factors. Paper presented at the Annual Spring Meeting of the Psychometric Society, Iowa City.

Tan, Y.H., Theon, W., 2001. Toward a generic model of trust for electronic commerce. International Journal of Electronic Commerce 5 (2), 61–74.

Van Slyke, C., Bélanger, F., Comunale, C., 2004. Adopting business-to-consumer electronic commerce: the effects of trust and perceived innovation characteristics. The Data Base for Advances in Information Systems 35 (2), 32–49.

Venkatesh, V., Morris, M., Davis, G., Davis, F., 2003. User acceptance of information technology: toward a unified view. MIS Quarterly 27 (3), 425–478.

Warkentin, M., Gefen, D., Pavlou, P., Rose, G., 2002. Encouraging citizen adoption of e-government by building trust. Electronic Markets 12 (3), 157–162.

Welch, E.W., Hinnant, C.C., Moon, M.J., 2005. Linking citizen satisfaction with e-government and trust in government. Journal of Public Administration Research and Theory 15 (3), 371–391.

West, S.G., Finch, J.F., Curran, P.J., 1995. Structural equation models with nonnormal variables: problems and remedies. In: Hoyle, R.H. (Ed.), Structural Equation Modeling: Concepts, Issues, and Applications. Sage Publications, Thousand Oaks, CA, pp. 56–75.

Zucker, L.-G., 1986. Production of trust: institutional sources of economic structure, 1840–1920. Research in Organizational Behavior 8, 53–111.