"IT's Complicated…": Influence of Perceived Sacrifice and Trust on e-Service Adoption

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Abstract. In order to increase usage of e-government services, there is a need for better understanding of factors driving citizens' use of such services. This study addresses the following research problem: How do trust, perceived sacrifice, and optimism bias influence citizens' intentions to use public e-services? A model of e-service adoption is proposed and tested on a random sample of Swedish citizens. The model confirms the influence of trust and optimism bias, and the results also suggest that perceived sacrifice in terms of time and effort can be a strong predictor of behavioral intentions.

Keywords. e-government, intention to use, trust, perceived sacrifice, optimism bias

1 Introduction

During the last two decades, governments have invested heavily in developing electronic government (e-government). Today, it is viewed as an important way to provide better services to citizens and make public administration more efficient [30]. However, this great potential only can be realized if citizens are willing and able to adopt the e-services offered by the government. For many years, e-government has been developed based on governments' internal needs, rather than from the perspective of users' needs and wants [20]. The assumption was that citizens were waiting for e-services to be developed and all that was needed was more rapid development of such services [20]. Yet, the acceptance and usage of available e-services has not been as extensive as expected [15].

In order to increase usage of e-government services, there is a need for better understanding of factors driving citizens' use of such services [19]. Previous research has identified lack of trust as a major barrier for the adoption of e-services [7, 26, 33]. For e-commerce in general, several studies have explored the relationship between trust and behavior, but with respect to e-government adoption, researchers are just beginning to empirically investigate the role of trust [e.g., 4, 29]. In order to add to the understanding of trust as a salient predictor of consumer behavior, and in response to calls for further research [e.g., 26, 31], this study proposes a model of e-service adoption that incorporates trust, perceived sacrifice, and optimism bias.

According to the theory of planned behavior, the intention to engage in a particular behavior is a good predictor of performing the behavior [1]. Intention to use subsequently has been found to be highly correlated with actual use of information technology [e.g., 4, 23]. To be able to include non-users as well as current users, thus making results more generalizable, this study applies intention to use government e-services as the dependent variable. Hence, the following research problem is addressed: *How do trust, perceived sacrifice, and optimism bias influence citizens' intentions to use public e-services?*

The remainder of this paper proceeds as follows: Section two presents the theoretical foundations of the proposed research model and the hypotheses. The methodology of the study is described in section three, which is followed by a presentation and discussion of the results. Finally, conclusions are drawn and limitations of the study are discussed, along with suggestions for further research.

2 Conceptual Background and Hypotheses

2.1 Trust

Trust has been explored and defined in numerous research studies within different areas. A widely used definition of trust is "an expectancy that the promise of an individual or group can be relied upon" [25]. As trust reduces behavioral uncertainty, it gives the citizen a perception of having some control over potentially uncertain situations [23]. McKnight et al. [22] pointed to the importance of distinguishing among different types of trust, and developed multi-dimensional trust measures. Other authors have adapted these measures and used them in diverse contexts, including e-government. For governmental web sites and e-services, trust has been conceptualized as consisting of *trust in the Internet* as the facilitating technology for e-government (also referred to as institutional trust), and *trust in the government* as the provider of the service [4, 26, 27, 29]. In addition, research suggests that a person's general propensity to trust others; i.e., his/her *disposition to trust*, is important as it can affect behavioral intentions via its influence on trust in the Internet and government [4, 22]. We therefore expect that:

H_1: Disposition to trust is positively related to trust in the Internet

H_2: Disposition to trust is positively related to trust in the government

If citizens trust the service provider (i.e., government), they also might be more inclined to trust the medium through which the service is delivered. Though not hypothesized, Bélanger and Carter's [4] study showed a very high correlation between trust in the government and trust in the Internet. Similarly, Teo et al. [29] as well as Horst et al. [14] found that trust in the government had a significant positive correlation with trust in an e-government website. Hence, we hypothesize:

H_3: Trust in the government is positively related to trust in the Internet

Moreover, a number of studies have found that trust influences behavioral intentions such as the intention to use, or continue using, an e-service. The relationship has been tested as a direct link [4, 8, 21, 23, 26], as well as indirectly, via

for example perceived risk [26, 27], attitude [15], and e-service quality [29]. Considering the emphasis on trust in institutions and technology as a precondition for e-commerce and e-government acceptance [e.g., 22, 27], the following hypotheses are stated:

H_4: Trust in the government is positively related to intention to use

H_5: Trust in the Internet is positively related to intention to use

2.2 Optimism Bias

Trust in the Internet has been shown to reduce the perceived risk of using e-commerce and e-government services [e.g., 8, 23, 26]. However, some studies suggest that even when citizens perceive high levels of risk, they still are willing to use e-services [4, 8]. This behavior might be explained by *optimism bias*, which is "a systematic discrepancy between individuals' risk perceptions and their actual risk for negative life events" [5]. That is, people tend to think that because of their knowledge and ability, they are less susceptible to risk than the average person [26, 27]. For example, Campbell et al. [5] found that heavy Internet users were significantly more optimistic than light Internet users about positive and negative Internet events. In the context of e-government, it seems likely that a higher level of trust in the Internet as a facilitating technology could enhance the degree to which citizens feel that they are more competent than the average Internet user [cf. 26, 27]. Thus:

H_6: Trust in the Internet is positively related to optimism bias

In addition, research has found that optimism bias significantly increases the intention to use government e-services, presumably because it diminishes the impact of risk [6, 26, 27]. These authors therefore point to optimism bias as an important factor in e-government adoption and call for further research on its influence. Consequently, it is hypothesized that:

H_7: Optimism bias is positively related to intention to use

2.3 Perceived Sacrifice

As indicated above, several studies in the information systems area have integrated constructs of perceived risk, primarily in terms of privacy and security, in models of trust. Within marketing and consumer behavior research, however, negative influences on purchase or usage intentions sometimes also are conceptualized in terms of *perceived sacrifice*, consisting of the total monetary and non-monetary costs associated with acquiring the product or service [e.g., 9, 16, 28]. While monetary costs (e.g., purchase price) usually are not relevant in the context of e-government services, it can be argued that non-monetary sacrifice, such as the perceived time and effort involved, could work as a barrier toward e-service adoption. That is, if citizens expect that using e-services will be time-consuming and complicated, they are more likely to choose traditional means of receiving the service.

Based on in-depth interviews with taxpayers, Rotchanakitumnuai [24] suggested that time and effort would not influence intention to use online tax filing for frequent Internet users. However, the relationship has not been tested empirically on a larger

sample including both users and non-users of public e-services. In other contexts, perceived non-monetary sacrifice has been shown to negatively affect behavioral intentions [e.g., 3, 18]. Therefore, we expect that:

H_8: Perceived sacrifice is negatively related to intention to use

Further, as trust reduces uncertainty [23, 26], it is possible that trust in the Internet channel contributes to decreasing perceptions of e-services as time-consuming and complicated to use. This notion is mirrored in Pavlou's [23] study, in which trust had a significant, positive influence on perceived ease of use. We therefore hypothesize that trust in the Internet would have a significant, negative influence on perceived sacrifice. Formally stated:

H_9: Trust in the Internet is negatively related to perceived sacrifice

Finally, it seems probable that citizens who feel that they are more competent than the average Internet user would anticipate lower levels of time and effort involved in using an e-service. Specifically, optimism bias, which we conceptualize in the same way as Carter et al. [6], Schaupp and Carter [26], and Schaupp et al. [27], is expected to reduce the perceived sacrifice. Hence:

H_{10}: Optimism bias is negatively related to perceived sacrifice

Figure 1 displays graphically the proposed research model incorporating the ten stated hypotheses and the relationships among the constructs.
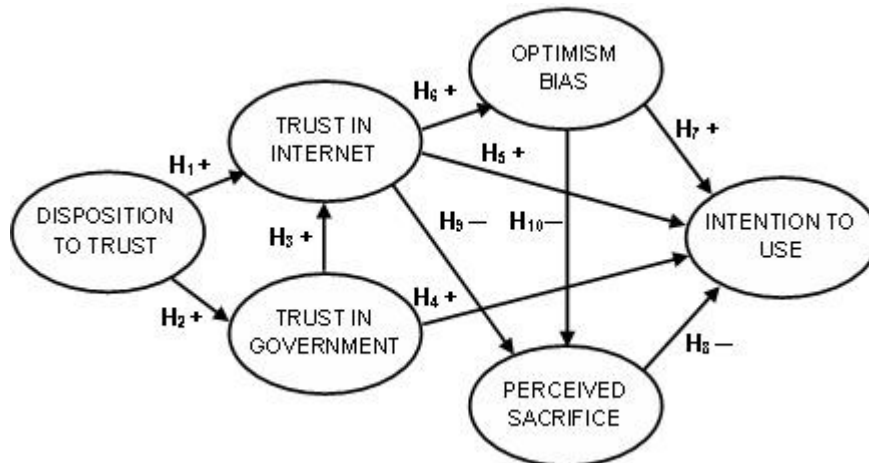

Fig. 1. Research Model

3   Data Collection

To measure the studied constructs, we developed a questionnaire derived primarily from previous literature (see Appendix A). A few items were added based on results from eight focus group interviews with citizens. Seven-point Likert-type scales indicating the strength of agreement with statements were used for all constructs,

except optimism bias, for which we used a seven-point scale anchored by 1 (much less able than the average Internet user), 4 (average ability), and 7 (much more able than the average Internet user) [cf. 26, 27]. Questions covering background information such as demographics and Internet use also were included in the instrument. "E-service" was described in the beginning of the questionnaire as making applications, as well as changes or supplements to applications, via the municipality's web site. It also was emphasized that no previous experience of such e-services or the municipality's web site was needed to be able to answer the questions.

After pre-test on a small sample of citizens, followed by some adjustments, questionnaires were sent via regular mail to 1,600 randomly selected Swedish citizens between 20 and 64 years of age. We obtained a total of 422 valid responses, corresponding to an effective response rate of 26.4%. Assuming that late respondents are similar to those who do not respond, non-response bias was checked by comparing demographics and Internet use variables between the first and last quartile of responses [cf. 2]. T-tests and Chi-square tests did not result in any significant differences between early and late respondents, indicating that non-response bias was not a main concern.

Gender distribution among respondents was fairly even, with 56% being males. The mean and median age of the sample was 44 and 42 years, respectively. 88% of the respondents were working (i.e., employed or owners of businesses), with the remaining respondents being students, retirees or unemployed. Half of the respondents had a university education, and 92% of the sample indicated that they used the Internet daily. On average, respondents considered themselves to be experienced Internet users – on a seven-point scale representing strength of agreement with the statement "I am an experienced Internet user", the mean was 5.75. A vast majority of the sample (86%) indicated that they generally visit the municipality's web site at least once in a while, but most of them rather infrequently (less than once/month). This means that 14% of the respondents said they never visit the municipality's web site.

4   Results

4.1 Measurement Validation

Overall, there were few missing values in the dataset, and all variables could be retained. Little's MCAR test was non-significant ($p = 0.32$), indicating that data were missing at random. Since we wanted to test the hypotheses through structural equation modeling, which does not comply with missing data, the few remaining missing values in quantitative variables were replaced by series mean.

To evaluate and refine the scales, we performed a confirmatory factor analysis using AMOS 18 software. Modification indices and standardized residual covariances pointed to possible problems with two items; one in the trust in government construct and one in optimism bias. These items therefore were removed one by one, which improved model fit. The final measurement model had a normed χ^2 value of 2.24,

GFI .94, CFI .97, and RMSEA .05, suggesting good fit between the model and data. Descriptive statistics of the resulting factors are shown in Table 1 below. It can be noted that the means of all three trust dimensions are fairly high, whereas the average level of perceived sacrifice is low. The mean of the optimism bias construct is almost exactly the same as in the study by Schaupp and colleagues, where it was 4.83 [6, 26]. A one-sample t-test showed that the mean of the optimism bias measure is significantly higher (t = 13.25) than the scale midpoint, which corresponds to "average ability". This suggests that respondents overall rate themselves as more Internet savvy than the average Internet user.

Table 1. Descriptive Statistics

Construct	Min.	Max.	Mean	Std. Dev.
Disposition to Trust	1.00	7.00	5.35	1.06
Trust in Internet	1.00	7.00	5.04	1.31
Trust in Government	1.00	7.00	4.89	1.30
Optimism Bias	1.00	7.00	4.81	1.25
Perceived Sacrifice	1.00	7.00	2.22	1.26
Intention to Use	1.00	7.00	5.45	1.57

Next, discriminant and convergent validity among constructs were assessed by examining whether (1) all standardized factor loadings were significant and higher than .50; (2) the squared correlations between each pair of constructs were less than the variance extracted for each construct; and (3) the average variance extracted for each construct was higher than .50 [10, 13]. Table 2 displays the average variance extracted (diagonal values) and the squared correlations between constructs (off-diagonal values). Since all constructs met the stated criteria, they were considered to show sufficient validity.

Table 2. Correlation Matrix

Construct	Disposition to Trust (DtT)	Trust in Internet (TiI)	Trust in Government (TiG)	Optimism Bias (OB)	Perceived Sacrifice (PS)	Intention to Use (ItU)
DtT	.70					
TiI	.10	.77				
TiG	.11	.13	.74			
OB	.01	.24	.02	.78		
PS	.01	.18	.04	.17	.69	
ItU	.04	.32	.09	.26	.37	.67

Further, the reliability of the constructs was assessed. As Table 3 shows, Cronbach's alphas were well above the suggested cutoff point of .70 and all item-to-total correlations exceeded .50 [cf. 13].

Table 3. Construct Reliability

Construct	No. of Items	Cronbach's α	Item-to-Total Correlation

Disposition to Trust	3	.87	.73 – .78
Trust in Internet	3	.91	.77 – .88
Trust in Government	3	.88	.65 – .85
Optimism Bias	3	.91	.78 – .88
Perceived Sacrifice	3	.89	.66 – .88
Intention to Use	2	.76	.64

4.2 Hypotheses Tests

To test the stated hypotheses, we specified a structural model in AMOS 18 according to the research model (see Figure 1). Table 4 below summarizes the results.

Table 4. Structural Model Results

Hypothesized Path	Hypothesized Direction	Standardized Path Coefficients	Result
H_1: DtT → TiI	+	.22**	Support
H_2: DtT → TiG	+	.33**	Support
H_3: TiG → TiI	+	.29**	Support
H_4: TiG → ItU	+	.10*	Support (weak)
H_5: TiI → ItU	+	.27**	Support
H_6: TiI → OB	+	.48**	Support
H_7: OB → ItU	+	.20**	Support
H_8: PS → ItU	—	-.40**	Support
H_9: TiI → PS	—	-.29**	Support
H_{10}: OB → PS	—	-.27**	Support
Construct	R^2	Model Fit	
Trust in Internet (TiI)	.18	χ2/df	2.17
Trust in Government (TiG)	.11	GFI	.94
Optimism Bias (OB)	.23	CFI	.97
Perceived Sacrifice (PS)	.24	RMSEA	.05 (*PCLOSE* .30)
Intention to Use (ItU)	.53		

*) $p<.05$
**) $p<.01$

As the table shows, model fit indexes suggest that the structural model is not disconfirmed by the data, and all ten hypotheses receive empirical support. Altogether, the model explains a fairly high portion (53%) of the variance in the intention to use municipal e-services.

The relationships among the three trust constructs (H_1 – H_3) work as expected. Disposition to trust appears to be more strongly connected to trust in the government than to trust in the Internet. However, the correlation between trust in the government (TiG) and intention to use (ItU) is low (albeit significant at $p<.05$), thus lending only weak support to H_4. Even though the mean of the trust in government measure was very similar to previous research conducted in the US (this study: 4.89, [4]: 4.62, [26]: 4.92), it seems that Swedish citizens' intentions to use municipal e-services are affected mainly by other factors. Hence, trust in the Internet (H_5), optimism bias (H_7), and perceived sacrifice (H_8) all have stronger influence on the intention to use.

In particular, the degree to which citizens expect the use of municipal e-services to be complicated and time-consuming (i.e., the perceived sacrifice) appears to hamper usage intentions. Considering that some earlier studies have found non-significant (see [8] for a summary) or even positive [4] correlations between perceived risk and intention to use, it is possible that the expected hassle involved is a better predictor of behavioral intentions than risk, at least in a context in which the majority are frequent Internet users.

Regarding the influence of optimism bias, the result is similar to previous findings [6, 26, 27], but the effects of trust differs from the studies of Schaupp and Carter [26] and Schaupp et al. [27], in which trust in the Internet did not have a significant correlation with the intention to use e-government services. This perhaps could be explained by the fact that the results in those two papers were based on a student sample, while a broader, random sample of citizens was used in this study.

Trust in the Internet is strongly correlated with optimism bias (H_6), explaining 23% of the variance in the construct, and it also decreases perceived sacrifice, as suggested in H_9. In addition, feeling more competent than the average Internet user appears to lower the degree to which one expects using e-services to be cumbersome (H_{10}).

5   Conclusions

This study integrated three dimensions of trust, optimism bias, and perceived sacrifice in a model to explain Swedish citizens' intentions to use municipal e-services. While the model confirms the influence of trust and optimism bias, the results also suggest that perceived sacrifice in terms of time and effort can be a strong predictor of behavioral intentions. That is, as people in general use the Internet frequently, they become more familiar with possible privacy risks and feel that they can handle them, but if they expect that using an e-service will be time-consuming and complicated, they would rather use traditional means of receiving the service. Hence, municipalities and other government agencies should focus on offering as easy-to-use e-services as possible, and also inform citizens about these services and how they can be used.

Moreover, municipalities could integrate trust building in their market communications. Enhanced trust in the government as a service provider and, primarily, trust in the Internet as the facilitating technology for e-government contribute to higher intentions to use, and also indirectly by increasing optimism bias and decreasing perceived sacrifice.

5.1 Limitations and Suggestions for Further Research

Although the results in this study are based on a random sample of citizens of varying ages and backgrounds, there are some limitations that should be considered when interpreting the results. First, while the tests for non-response bias did not reveal any significant differences between early and late respondents, the fact that almost 74% did not respond means that generalization to the population should be made with some caution. Still, the response rate of 26.4% is well in line with, or above, similar

studies that have used postal surveys. Our sample size of 422 also is relatively large compared to many other user studies in the e-government area.

Second, the use of a cross-sectional survey means that we cannot ascertain causal relationships between constructs in the model. Therefore, additional longitudinal or experimental research is warranted.

Our model was tested in the context of Swedish municipal e-services. While citizens' adoption of e-government in municipalities is relatively under-researched compared to e-government on a national level, it could be worthwhile to study whether this model also applies on other levels and in other countries.

The inclusion of perceived sacrifice in a model of trust and e-government adoption shows promising results. To keep the model parsimonious, we used a unidimensional, three-item measure of perceived non-monetary sacrifice. Future research could address the influence of sacrifice using more comprehensive scales. If there are governmental e-services that involve some kind of economic transaction, it also would be interesting to include a monetary sacrifice construct in the model.

Finally, it is possible that some of the relationships among the studied constructs can vary between different groups of citizens. Further studies can explore moderating variables; for example, users vs. non-users of e-government services, younger vs. older citizens, or frequent Internet users vs. non- or low Internet users.

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Appendix A: References to Questionnaire Constructs

Construct	No. of Items	References
Disposition to Trust	3	[4, 11]
Trust in the Internet	3	[4, 22, 32]
Trust in the Government	4	[22, 29], focus groups
Optimism Bias	4	[26, 27], focus groups
Perceived Sacrifice	3	[12], focus groups
Intention to Use	2	[12, 17]