



The willingness of e-Government service adoption by business users: The role of offline service quality and trust in technology

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ABSTRACT

Prior e-Government research has paid much attention to e-Government service adoption from the supplier side – the government – while mostly overlooking the user side of e-Government, such as citizens and businesses. While there have been some initial efforts to study citizens in their adoption behavior, few have examined what influences the willingness of businesses in adopting e-Government services. This research attempts to fill this research gap by addressing the following research question: Why are some businesses more willing to adopt e-Government applications to perform transactions with the government than others? The authors argue that the willingness of a business to adopt e-Government depends on the perceived quality of government services through traditional brick and mortar service channels (offline service channels), and the level of trust businesses place in the internet technology itself. Competing hypotheses are developed with regard to the role of perceived quality of offline services on the business user's willingness to adopt e-Government services. Using data obtained from a local district government in Seoul, Korea, the analysis revealed that the willingness to adopt e-Government increased when business users perceived high quality service provision in offline service channels. However, trust in the internet technology itself did not have any significant impact on their willingness. The theoretical and practical implications of the study finding are discussed.

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1. Introduction

Although e-Government – defined as electronic delivery of government services primarily using Web technologies (Holden, Norris, & Fletcher, 2003) – has been rapidly adopted by the government at all levels, the adoption of e-Government services by citizens and businesses has been relatively slow. For example, 60% of taxpayers in the United States filed documents for federal tax returns online during the 2008 filing season, when the goal set by the U.S. Congress was 80% by 2007 (IRS, 2008). Furthermore, the adoption rate for online local tax filing is lower than online federal tax filing. As of 2006, at the local level, 48% of taxpayers reported local tax return documents online while all state governments had already adopted online local tax filing services (Duncan, 2006).

Prior e-Government research has paid much attention to e-Government service adoption from the supplier side – the government (Ho & Ni, 2004; Moon, 2002; Norris & Moon, 2005), while the user side of e-Government has been mostly overlooked. Even though there has been some initial efforts to study the individual

citizens in their e-Government adoption behavior (Belanger & Carter, 2008; Welch, Hinnant, & Moon, 2005), few have examined what factors influence businesses in their decision to adopt e-Government services in their transactions with the government.

The study of a business user's adoption of e-Government services is important from a practical standpoint. Private sector businesses are key economic actors in our society and they are crucial customers of public services, as well as an essential source of government revenue. Although both business and citizen users might share some common rationale behind the adoption of e-Government services (e.g. saving time and cost, increasing accuracy, enhancing reliability, etc.), the relationship between citizens and the government and businesses and the government is fundamentally different. In particular, the roles of citizens include: taxpayers, customers, and political constituents to whom the government is accountable through various political processes (such as voting), whereas the roles of businesses include: taxpayers and customers, but not political constituents. Moreover, citizen and business users may perceive the benefits and risks of adopting government service differently. For example, when citizen users make a decision, they might rely on the perceived benefits and risk shaped by their personal experience, beliefs, and general attitudes. However, business users' decision making processes may be more complex and dynamic because their decisions are made on the basis of collective action. Despite such differences, business users' motivation behind adopting e-Government services has received little attention by scholars in public administration.

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This research attempts to fill this gap by addressing the following questions: Why are some business users more willing to adopt the internet to conduct business with government than others? Traditionally, government organizations have provided their services in brick and mortar office settings (offline). However, with the advent of the internet, an increasing number of government services are being provided online over the internet (online). With the emergence of the new technology and new ways of performing transactions with the government, business users face the question of whether to continue using the traditional offline service channel or switch to the new online channel.

Faced with such a question, we argue that the business user's willingness to adopt e-Government services depends on the perceived quality of services provided through offline channels because the business user's prior interactions with the government through offline service channels shapes their belief, confidence, and trust in the government, which in turn translate into the perception of the quality of service provided online. We also propose that the business user's adoption decision rests on the trust they place in the internet technology itself because their past online experience with the technology (e.g. online purchasing) would influence their perception of the new e-Government applications.

We discuss this argument by focusing on the adoption of an online tax filing service by business users in a local government setting in South Korea. Business firms in South Korea are responsible for paying national and local business taxes to the central and local government. It is mandatory for businesses to submit a tax report to the local government every year to ensure that a business firm pays for the exact amount of local business taxes charged. In Korea, local governments face the challenge of a low adoption rate of the online local tax filing service. For example, as of 2007, only 81% of taxpayers in Korea used e-Government services, which are called "home tax systems," as a means of filing national tax reports online (NTS, 2008); 18% of taxpayers in Seoul used online services, called "e-tax systems" as a primary tool for paying for local tax (SMG, 2009). To test the proposed model, this study uses a part of data collected from an e-Government research project with Gangnam district in South Korea. In particular, we use business survey data collected from 216 private firms who filed local business tax reports to Gangnam district through offline service channels in 2004.

The first section of this research critically reviews the current new technology adoption literature. Based on the critical literature review, we then propose a theoretical framework for the e-Government adoption by business users. The following section describes the research method, encompassing data collection, and measurement of variables. The testing results of the research model and findings are then discussed. And finally, this research concludes with a discussion of the limitations and implications of the research.

2. Theoretical background

Generic studies on innovation adoption and diffusion have been widely applied to understand why and how organizations and individuals adopt new technology. Especially, the Diffusion of Innovation (DOI) model has emphasized the attributes of new technology as key determinants of adoption (Rogers, 1995; Tornatzky & Fleischer, 1990). These attributes encompass compatibility, complexity, and the relative advantages of new technology. The DOI model argues that organizations and individuals tend to adopt new technology once they perceive that the new technology is compatible with their values and beliefs, it is less complex to learn, and it provides relative advantages (Forman, 2005; Lewis, Agarwal, & Sambamurth, 2003; Moore & Benbasat, 1991; Mustonen-Ollila & Lyytinen, 2003). Similarly, the Technology Acceptance Model (TAM) has highlighted that individuals adopt new technology once they perceived the usefulness and easiness of use (Davis, 1989; Devaraj, Easley, & Crant, 2008; Venkatesh, Davis, & Davis, 2003). Recently, as the internet has

been widely used as a strategic tool for real-time online transactions, scholars in technology innovation have paid attention to the role of medium characteristics, such as trust in the internet technology in the adoption of online purchasing (Belanger & Carter, 2008; Pavlou, 2003).

Some scholars in public administration have applied the DOI and the TAM models to examine the role of the perceived relative advantages, usefulness and easiness in the adoption of GIS (Nedovic-Budic & Godschalk, 1996), an executive decision making systems (Berry, 1997) and e-Government (Ho & Ni, 2004). Another group of scholars in public administration have paid attention to the role of the characteristics of government organization as a new technology adopter. These attributes include various organizational factors, such as size (Brudney & Selden, 1995; Moon, 2002), red tape (Moon & Bretschneider, 2002; Pandey & Bretschneider, 1997), executive support (Perry & Kraemer, 1980) and individual characteristics such as education, age, administrative role (Bugler & Bretschneider, 1993; Lee, 2008), and organizational power (Lee, 2008). Other scholars have found that new technology adoption by government organizations is affected by various external environmental factors, such as community size (Kraemer, King, Dunkle, & Lane, 1989; Weare, Musso, & Hale, 1999), availability of new technology providers (Perry & Danziger, 1980), and external political context (Ho & Ni, 2004; Weare et al., 1999).

Specifically, some scholars have utilized TAM and DOI as primary theoretical frameworks to examine taxpayers' adoption of online tax filing services provided by the government (Chang, Li, Hung, & Hwang, 2005; Fu, Chao, & Farn, 2004; Hung, Chang, & Yu, 2006; Schaupp, Carter, & Hobbs, 2009). They found easiness (Fu et al., 2004; Hung et al., 2006), usefulness (Chang et al., 2005; Fu et al., 2004; Hung et al., 2006), computing experiences (Fu et al., 2004), perceived credibility/trust of online filing systems (Chang et al., 2005), and perceived risk (Schaupp et al., 2009) as key determinants of online filing adoption by individual taxpayers.

However, prior studies of new technology adoption have paid little attention to the role of a prior relationship between an innovation provider (e.g. a local government providing an online business tax filing service) and an innovation adopter (e.g. business user) in new technology adoption. A new technology adopter may not only regard the new technology as a new tool for gaining benefits, but also consider it as an opportunity to build a new relationship with a new technology provider (Nicolaou & McKnight, 2006). The choice of creating a new relationship with another organization is often shaped by the quality of any existing relationship with the organization (Granovetter, 1985; 1992; Uzzi, 1996, 1997, 1999). Existing or prior relationships provide an innovation adopter with an opportunity to access information about how an innovation provider managed existing technologies and delivered services using them. An innovation adopter's past experiences with an innovation provider often shapes his or her attitude and belief in an innovation provider's reliability, credibility, and capability while managing new technology functions and delivering new services. Recent empirical studies (Belanger & Carter, 2008; Pavlou & Gefen, 2004; Welch et al., 2005) have supported that relational characteristics such as trust in the institution who directly or indirectly provides new technology service positively influence users' adoption.

3. Model and hypotheses

This study suggests a theoretical model of business users' e-Government service adoption by mainly focusing on the perceived quality of offline services and trust in the internet technology. We propose that the adoption of e-Government services by business users depends on their perceived quality of offline services and trust in the internet technology.

3.1. Offline service quality

Offline service quality may have two competing effects on the adoption of e-Government applications. First, from the standpoint of rationality-based models (i.e., the DOI and the TAM models), business users with a positive experience using offline services are less likely to adopt e-Government service; rather, they are likely to continue using offline channels as a means of interacting with a local government. Business users might switch to online channels when they have confidence that e-Government provides better benefits than offline service does.

The decision to switch from offline to online transaction involves both opportunity and risk. Online transaction provides business users with an opportunity to save time and money while performing the necessary paperwork. For example, online tax filing allows business users to file, report, and update their tax records online. They can submit their tax report over the internet without having to visit the crowded government office and the online application allows them to reduce input errors while enabling them to update their information on a real time basis. However, switching to an online channel also involves risk. Business users might face uncertainty regarding the quality of online service as they are unsure of the quality of the services they would experience through an online service channel if they switch. Also, they do not know exactly how much the switching, which would involve such actions as learning the new technologies, would cost them (Shapiro & Varian, 1999).

In addition, they might need additional organizational resources and commitment to gain full benefits from adopting e-Government service. Furthermore, business users might possess a strong preference for keeping the status quo, which is to use existing offline channels to perform transactions with the government because it would reduce uncertainty triggered by adopting new services. Confronting uncertain service quality, switching costs, and unknown benefits, business users are likely to stay with the status quo — offline service channels. Therefore we propose the following hypothesis:

H1. *Business users who perceive high quality offline services are less willing to adopt e-Government services.*

However, the counter-argument is also feasible. Once a local government offers the same service through both online and offline channels, business users may not regard the offline channel as an independent service channel separated from the online channel (Kaufman-Scarborough & Lindquist, 2002). To business users who have maintained a relationship with a local government through offline channels, e-Government services not only function as an innovative tool for performing transactions with the government, but also provide an opportunity to build a new relationship with the local government. Specifically, business users' prior experiences with the quality of offline services provide them with an opportunity to build trust in government (Welch et al., 2005) because trust is often constructed through ongoing interactions (Gulati & Gargiulo, 1999; Uzzi, 1997, 1999).

Furthermore, positive offline transaction experiences tend to enhance trust that government is capable of providing high quality offline services. While business users face uncertainty about the quality of online services provided by a local government, enhanced trust often serves to reduce the uncertainty. Therefore, enhanced trust gained from past experiences of positive offline service leads business users to expect that the promise of government on online service quality is reliable, and serves to reduce these uncertainties about the government's capability of providing high quality services through an online medium. Recent studies on consumers' choice of offline and online channels (Hansen, 2005; Kaufman-Scarborough & Lindquist, 2002; Madlberger, 2006) found that consumers' perception of the offline services influences their attitude toward online services. Thus,

business users who experience positive service quality through offline transactions are likely to adopt e-Government services. Different theories on the relationship between business users' perceived quality of offline service and their e-Government adoption lead us to develop the following hypothesis:

H2. *Business users who perceive the quality of offline services to be high are more willing to adopt an e-Government service.*

3.2. Trust in internet technology

This study also argues that e-Government service adoption depends on business users' trust in internet technology. In addition to uncertainty about the quality of online services, business users might face uncertainty triggered by the use of new internet technology that enables e-Government services. Since offline business users have not used an e-Government service before, they might be concerned with the reliability and security of online transactions (e.g., financial and business information). Under such situations, business users may rely on their Web technology experiences gained from past relationships with other business firms in conducting e-commerce activities (e.g. online purchasing). Uncertainties about the technology itself can be reduced if business users have had positive experiences using new Web technologies. In other words, positive experiences with the internet technology may enhance their belief that e-Government applications are capable of providing secure and reliable transactions. The findings from prior studies support that users' trust of internet technology is a key predictor of new web-based applications adoption (Belanger & Carter, 2008; Venkatesh et al., 2003).

H3. *Business users who put greater trust in the internet technology are more willing to adopt e-Government services.*

3.3. Interaction effect between offline service quality and trust in the internet technology

The competing explanations for the effects of offline service quality on the adoption of e-Government services for business may be reconciled by incorporating the interaction effect with the business user's trust in internet technology. H1 proposes a negative influence of the perception of high offline service quality on e-Government service adoption because business users satisfied with the offline service would be less likely to run the risks of switching from offline to online.

One may argue that offline users' disincentives to switch to new e-Government services can be reduced if users have positive experiences with internet technology in the private sector or with other e-Government services. On the other hand, less trust in internet technology will reinforce the negative attitude toward adopting online service. Hence, we propose that the negative effect of the offline service quality on the willingness to adopt e-Government service depends on the magnitude of trust in the internet technology.

H2 articulates that businesses are more likely to adopt e-Government services when they perceive high quality offline services because the positive experience strengthens their trust in government's capability to provide the online service. The positive effect of offline service quality on online service adoption can be also influenced by the level of trust in the internet technology. Overall, businesses may have a high level of confidence in government's capability to provide reliable services from their positive experiences with offline services, but, if the medium is the internet, they may hesitate to switch to the online service because of their concerns about the technology itself. The positive effect of offline service quality on online service adoption can be reduced in the presence of less trust in the internet technology. On the contrary, greater trust in the internet technology would strengthen the positive effect of offline

service quality on the e-Government adoption by reinforcing their trust in the government's capability to choose and provide reliable public services. The fourth hypothesis incorporates the effect of trust in the internet technology moderating the effect of offline service quality on e-Government service adoption:

H4. *Business users who perceive high quality offline service are more likely to adopt e-Government services when they have high trust in the internet technology than when they have lower trust in the internet technology.*

4. Research method

4.1. Data

In 2004, we collected data from a local government in Seoul, Korea. Gangnam-gu is one of the 25 districts in Seoul, the capital city of Korea. As a part of a larger e-Government research project, we conducted a survey to assess the business user's satisfaction with online and offline services offered by the district government and identify the factors affecting the business user's attitude toward e-Government services.

Gangnam-gu is a central business area and one of the most affluent districts in Seoul. As a leader in e-Government practice in Korea, the district government has initiated numerous e-Government projects to improve efficiency in its service provision, as well as its responsiveness to the residents and business owners. The scope of e-Government projects encompasses G2C (government to citizen), G2B (government to business), and G2G (government to government).

The targeted service of the data collection for this study is the Local Business Tax Reporting service. The Local Tax Law in Korea requires business firms to submit a local business tax payment report to the local government each year. The purpose of this filing is to verify if business firms have paid the exact amount of local taxes charged by the local government. The filing of the tax payment report involves multiple forms of documents to verify the assessment of local tax. Approximately 27,500 business firms were registered in Gangnam-gu as of 2004 and these firms became the theoretical population of the survey we conducted.

Each year, the district government sends an instructional guide for filing a local business tax report to about a half of the registered business companies. The district limits the number of business firms to contact due to its lack of capacity to inspect all the business tax reports every year. In 2004, when the survey was conducted, the district government notified 15,000 business firms to file the local business reports. The instructions include the information for the two distinctive ways of filing their tax payment reports: one is filing the report by mail or by visiting the district office and the other is submitting the report through the e-Government website.

Out of the 15,000 firms, about 5000 companies filed the reports in 2004. The remaining 10,000 businesses, which are typically small in size, did not report local business tax records. Out of the 5000 companies, 3390 companies have done a tax report through mail or visiting the district office in person and only 1610 have submitted their tax reports through the online service. Thus, the sampling frame for the offline business user survey is the list of 3390 business companies who have submitted local business tax reports by mail or in person in 2004.

We randomly selected 836 business companies out of the 3390 business firms who filed their tax reports who filed a business tax report through mail or in person. None of the surveyed businesses filed their tax reports online. The sampling frame includes the name and phone number of the person who filed a local business tax report in 2004. Survey implementation was contracted out to a private survey research company to conduct a phone survey using the survey instrument developed by the research team. The response rate was

25.8% for 216 completed surveys. Table 1 and Table 2 show the organizational characteristics of the sample in age, annual sales, size, and business areas.

5. Measurement

The sample of this study includes only the business firms who did file their tax reports offline. Therefore the dependent variable is not measuring if the businesses actually used online service but if they are interested in using the online service in the future. The dependent variable – *willingness to adopt the e-Government service* – is a dichotomous variable where zero means the business is not willing to submit the report online and one indicates that the business is willing to change and use an e-Government application to submit the report.

The independent variables are grouped into two sets. One set consists of service quality variables and the other, technology attitude variables. The service quality measures used for this study have been drawn from the SERVQUAL measures. The original SERVQUAL measures were developed by Parasuraman, Zeithaml and Berry (1985) and have been tested, modified, and utilized in various research areas (Devaraj, Fan, & Kohli, 2002; Gounaris & Dimitriadis, 2003). Although our survey items used for measuring the offline service quality are not exactly identical with the original SERVQUAL measures, we constructed them by utilizing the multiple dimensions conceptualized for the SERVQUAL measures. The five attributes of service quality are defined as follows:

1. *tangibles* – physical facilities, equipment, personnel, and communication materials;
2. *reliability* – ability to perform the promised service dependably and accurately;
3. *responsiveness* – willingness to help customers and provide prompt service;
4. *assurance* – knowledge and courtesy of employees and their ability to convey trust and confidence; and
5. *empathy* – caring and the individualized attention the firm provides customers (adapted from Parasuraman, Zeithaml, & Berry, 1988, p. 23).

Table 3 describes the variables and the survey items used to measure them and reports the descriptive statistics. Among the five dimensions of SERVQUAL type measures, *timeliness*, *responsiveness*, and *assurance* have been measured by multiple survey items. We calculated Cronbach alpha for these three dimensions to check the internal consistency of the items for each dimension and found that they are way above the critical point, 0.7. In addition to the five SERVQUAL type measures, we also used *promptness* of service processing and *overall satisfaction* with the filing process to measure the offline service quality. Finally, we generated the *service quality* variable by averaging the SERVQUAL measures and the additional service quality measures. These seven service quality measures comprising *service quality* are also found to be internally consistent (Cronbach alpha = 0.897). The measurements for *trust in internet technology* are composed of three variables: *website ownership*, *e-commerce usage*, and *government portal membership*. If a business

Table 1
Organizational characteristics of business firms.

Characteristics	N	Mean	S.D.	Min	Max
Years in business	216	10.743	10.770	0	90
Annual sales	170	28 billion won*	11 billion	3 million	1.2 trillion won
Number of employees	216	48.227	71.945	350	1

* One dollar is approximately 1170 Korean won as of February 1, 2010.

Table 2
Business types of respondents.

Business type	Freq.	Percent
Manufacturing	42	19.44
Electricity, gas, water	1	0.46
Construction	34	15.74
Wholesale and retail	59	27.31
Accommodation and restaurant	1	0.46
Transportation	3	1.39
Communication	2	0.93
Finance and insurance	6	2.78
Real estate and lease	7	3.24
Computer systems, R&D, professionals	45	20.83
Education	2	0.93
Health and social welfare	1	0.46
Maintenance and personal service	4	1.85
Etc.	9	4.17
Sum	216	100

owns a website, frequently performs e-commerce transactions, and if it is a member of the Gangnam-gu's web portal, we considered that the business has a relatively high level of trust in the internet technology. Three interaction terms are created by multiplying the

overall service quality with the three measures of trust in internet technology. To reduce the multicollinearity between the constituent independent variables and the interaction terms, we centered the independent variables by subtracting the mean from all observations.

To control some potential confounding effects, we included six control variables. First, the *e-Government awareness* variable measures if the business is aware of the presence of the e-Government service through which the business can file their business tax report online. Those businesses that have been aware of the presence of the online service, but have not adopted it are less likely to adopt it in the future. Local business tax reports are often filed by private tax accountants. Professional tax accountants may have different incentives and barriers to using the e-Government services compared to in-house employees. Thus, we created a second variable, the *tax accountant* dummy variable. We also control the possible influence of the type of reporting method in a traditional offline service setting (in this case by mailing or by visiting the office) on the willingness to adopt the e-Government services. The third variable, the *medium* dummy, is recorded as one, if the tax report was sent by mail, and zero, if it was submitted by visiting the government office in person. To control the effect of a firm's organizational resources, we added two variables

Table 3
Description of variables and measurements.

Variables	Description and measurement	Mean	S.D.
<i>Willingness to adopt</i>	Will you use a business tax filing service if it is provided through the GG website? (1: yes, 0: no)	0.715	0.452
<i>Offline service quality</i>	(Likert scale: 1: strongly disagree, 2: disagree, 3: neutral, 4: agree, 5: strongly agree)		
Timeliness (Cronbach alpha = 0.877)	The mean of four timeliness measures	3.233	0.921
	T1. Submitting a business tax file to the GG office to perform the transaction took a reasonable amount of time	3.199	0.886
	T2. Once I began to prepare to start filing a business tax form, it took a reasonable amount of time	3.146	0.926
	T3. Once I submitted my request for service (such as submitting your application form), it took a reasonable amount of time to receive the result of my request	3.218	0.781
	T4. Overall, I feel that the whole transaction was performed in a reasonable amount of time	3.150	0.873
Responsiveness (Cronbach alpha = 0.925)	The mean of five timeliness measures	3.257	0.791
	R1. It is easy to find the proper office/employee to conduct the service while filing a business tax report	3.210	0.975
	R2. When there were problems while filing a business tax form, they were handled readily	3.302	0.937
	R3. When I had questions while filing a business form, I could easily understand the employee's answer	3.289	0.886
	R4. I found the whole service process to be very responsive to my needs	3.254	0.819
	R5. In responding to my questions, the employee was prompt	3.273	0.899
Assurance (Cronbach alpha = 0.891)	The mean of six assurance measures	3.311	0.71
	A1. I have confidence that the service is delivered accurately	3.426	0.893
	A2. I trust that the service is delivered securely	3.363	0.846
	A3. I believe my personal information is not shared with others	3.225	0.972
	A4. I feel that the service process was easy to follow	3.098	0.915
	A5. The GG employee that I worked with to complete the transaction used a friendly tone in communicating with me	3.426	0.83
	A6. I felt comfortable communicating with GG employees while completing the transaction	3.328	0.839
Empathy	The GG employees provided me with individualized care and attention	3.093	0.895
Tangible	I found the GG office where I conducted this transaction to be visually pleasing	3.449	0.756
Satisfaction	Overall, I am satisfied with this service	3.316	0.862
Promptness	I completed what I am going to do with the GG when I visited the GG	3.342	0.867
Service quality (Cronbach alpha = 0.897)	The mean of "timeliness", "responsiveness", "assurance", "empathy", "tangible", "satisfaction", and "promptness"	3.302	0.668
<i>Trust in internet technology</i>			
Website ownership	Does your company have a website? (1: yes, 0: no)	0.639	0.481
E-commerce usage	Does your company do any of its regular business functions (e.g. purchasing) through the internet? (1: never, 2: rarely, 3: sometimes, 4: regularly, 5: frequently)	1.750	1.170
Gov. portal membership	Is your company a member of Gangnam-gu's web portal? (1: yes, 0: no)	0.213	0.410
e-Government awareness	Do you know that it is possible to file a business tax report through Gangnam-gu website? (1: yes, 0: no)	0.670	0.471
<i>Control</i>			
e-Government awareness	Did you know that it is possible to file a business tax report through the Gangnam-gu website? (1: yes, 0: no)	0.670	0.471
Tax accountant	Did a tax account file your company's business tax form in 2004? (1: yes, 0: no)	0.681	0.467
Medium	Did your company submit a business tax in 2004 by mail? (1: by mail, 0: in person)	0.852	0.356
Number of employees	Number of employees	48.227	71.945
Annual sales	Natural log of annual sales in Korean won	22.189	1.952
Years in business	Number of years in business	10.743	10.770

Table 4
Logistic regression results.

Variables	Model 1			Model 2			Model 3		
	Coef.	Std. Err.	Marginal change [§]	Coef.	Std. Err.	Marginal change	Coef.	Std. Err.	Marginal change
<i>Offline service quality</i>									
Timeliness	0.838**	0.418	0.132						
Responsiveness	1.232**	0.591	0.194						
Assurance	-0.545	0.633	-0.086						
Empathy	-0.135	0.455	-0.021						
Tangible	-0.068	0.383	-0.011						
Satisfaction	-0.278	0.433	-0.044						
Promptness	0.007	0.380	0.001						
Service quality				0.853**	0.341	0.144	0.710	0.710	0.120
<i>Trust in internet technology</i>									
Website ownership	0.687	0.517	0.108	0.314	0.456	0.053	0.278	0.464	0.047
E-commerce usage	0.280	0.222	0.044	0.211	0.204	0.036	0.211	0.212	0.037
Gov. portal membership	-0.514	0.535	-0.081	-0.397	0.484	-0.067	-0.378	0.526	-0.064
<i>Interaction terms</i>									
Service quality*web ownership							-0.316	0.747	0.032
Service quality*E-commerce							0.189	0.372	0.044
Service quality*portal membership							0.262	1.026	-0.053
<i>Control</i>									
e-Government awareness	-0.351	0.499	-0.055	-0.574	0.448	-0.097	-0.583	0.454	-0.098
Tax accountant	0.807	0.520	0.127	0.944**	0.469	0.159	0.987**	0.482	0.166
Medium (1: mailing, 0: visit)	0.397	0.618	0.063	0.667	0.575	0.113	0.617	0.583	0.104
Number of employees	0.004	0.004	0.001	0.002	0.004	0.000	0.002	0.004	0.000
Annual sales (natural log)	-0.132	0.156	-0.021	0.036	0.129	0.006	0.039	0.131	0.007
Years in business	-0.035*	0.019	-0.006	-0.032*	0.018	-0.005	-0.034*	0.018	-0.006
Constant	-0.412	3.689		-3.422	3.196		-2.995	3.879	
Number of observations	149			160			160		
Log likelihood	-69.277			-80.367			-80.153		
LR chi-square	30.65**			16.98*			17.41		
Pseudo R2	0.181			0.096			0.098		
E[y = 1]	0.804			0.785			0.786		

* p ≤ 10.

** p ≤ 05.

§ The marginal change is a change in the predicted probability of observing y = 1 as each continuous independent variable changes from 1/2 SD below the mean to 1/2 SD above the mean, with all variables at their mean. The marginal change for dummy variable is a change in the predicted probability as the dummy changes from 0 to 1, other variables constant at their means.

(variables four and five): *number of employees* and *annual sales*. The sixth, and last, control variable is *years in business* which controls the effect of organizational age on innovation.

6. Analysis and findings

The dichotomous dependent variable, *willingness to adopt*, enables us to estimate the probability that a business firm is willing to adopt the e-Government service. We use logistic regression to estimate the proposed model and also compute the marginal change in the predicted probability of intending to adopt e-Government services to show the relative impacts of explanatory variables¹. The change is estimated as each independent variable changes by one standard deviation below and above the mean.

Table 4 presents the results from the logistic regression and the marginal changes in the predicted probabilities. The estimation results for the first model where service quality measures are not integrated into a single variable show that only *timeliness* and *responsiveness* are significant positive antecedents of *willingness* to adopt e-Government services. In model two, the single variable for service quality – *service quality* – is found to significantly increase the

log odds of adopting e-Government, whereas none of the independent variables belonging to the group – *trust in internet technology* – are found to be significant in predicting the probability that business firms are willing to adopt e-Government service.

Among the six control variables, only the *years in business* variable is found to have a significant positive association with the probability of being willing to adopt the e-Government service in both models. Businesses using tax accountants are more likely to adopt the e-Government service as found in the second model where a composite *service quality* variable is incorporated. This result may indicate that the businesses who have been assisted by tax accountants expect that the online service will make the tax report filing easier than before and, thus, are more willing to adopt e-Government service.

The marginal change scores provide information for finding which variable is relatively stronger in terms of its influence on the predictability of adopting e-Government service. In model 1, a one standard deviation change in *responsiveness* increases the predicted probability of adopting the e-Government by 19.4%, while one standard deviation change in *timeliness* improves the predicted probability by 13.2%. The marginal change in *overall service quality* in model 2 also increases the predicted probability by 14.4%. In comparison to the control variable, i.e. *years in business*, which is significantly associated with the willingness to adopt e-Government service, service quality variables show a stronger impact on willingness in terms of marginal changes in the predicted probability.

The results of the two regression models provide evidence supporting H2 and suggest that business users tend to increase their

¹ To calculate the marginal change, we used the *prchange* function in STATA as suggested by Long and Freese (2006).

willingness to adopt the online services when they perceive the quality of the offline service to be high. The positive experiences with offline transactions with the government develop into a trust in the government's ability in providing high quality services in general (regardless of its service medium — offline or online) and hence, increase their willingness to adopt the online service medium.

The lack of statistical significance of the *trust in the internet technology* variables in predicting the willingness to adopt the e-Government service reveal that the business user's attitude toward e-Government services is not affected by their prior experiences with internet technology. Therefore, what is more important in influencing the willingness to adopt a new service medium is users' perception of the government's reliability in providing the service rather than their actual personal exposure to new technology itself.

In addition to testing the main effects of service quality and trust in the internet technology variables, we also empirically investigate the interaction effects proposed in H4. The results of model 3 show that trust in the internet technology does not significantly moderate the effect of *service quality* on the willingness to adopt e-Government. Moreover, adding the interaction terms do not improve the model's fit. We conduct the chi-square test to examine whether interaction terms significantly contribute to improving the full model with interaction terms in comparison to the reduced model without interaction terms. The difference in chi-square scores between two models is 0.43 ($\Delta\chi^2 = 17.41 - 16.98$), the degree of freedom is 3, and the corresponding p-value is 0.934, which is not significant at any typically accepted confidence level. Therefore, we do not find empirical evidence to retain the interaction terms.

7. Discussion

Several important findings emerged from the analysis. First, the analysis indicated that the perception of reliable government service provided through the traditional brick and mortar service channels significantly improved the willingness of business users in considering the online service alternative over the status quo offline service channel. Two competing hypotheses were tested in which the quality of traditional service channels was viewed as an inhibiting factor (H1), or a facilitating factor (H2) to online service adoption.

On the one hand, high quality offline service was viewed as an inhibiting factor to adopting online application as business users may prefer minimizing uncertainty and transaction costs by continuing to use offline service channels they perceive to be of high quality. In this case, the perception of high quality service transaction in the offline setting would *diminish* the willingness of business users (1) to switch from offline to online service channels and (2) to explore the potential benefits of online application as the opportunity cost of switching is relatively high and the potential of benefits from switching is low.

However, on the other hand, it was hypothesized that the perception of high quality service transaction with the government in the offline setting may instead translate into the perception of the quality of service transactions online as the former *increases* business users' trust in the government's ability to provide reliable, high quality online services. This consequently prompts business users to consider switching from offline to online service channels as they are perceived to be more advantageous given the cost-saving implications that are typically associated with e-Government applications (e.g. saving time and reducing error rates).

Findings indicate that the perception of high quality service interaction in the offline service setting in fact led to greater willingness to adopt the online application, thereby supporting the H2. This reveals that business users perceive high quality offline service transactions as an assurance of the government's ability in providing high quality online applications, which prompts them to explore the potential benefits of the new service medium, rather than

staying with the status quo to minimize the transaction cost. High quality offline service channels induce business users to trust the government's ability to provide reliable online services; this positive attitude toward the government functions as a stepping stone for business users to explore the benefits of the online application.

Local Business Tax Reporting service, as examined in this paper, involves multiple forms to submit in order to verify the amount of taxes paid, and potentially requires a high level of interaction with the government and its officials. Nevertheless, the willingness to switch from the traditional service method to online local business tax reporting service rose with the perception of high quality offline service interaction, indicating the willingness of business users to explore the potential benefits of the online service medium.

It is important to note that among the seven variables used as the measures of offline service quality, *timeliness* and *responsiveness* were the two variables that had positive impacts on the willingness to adopt the online application. This reflects that the business user's willingness to adopt the online application increased when they perceived the quality of critical aspects of the offline service (*timeliness* and *responsiveness* in this case) to be high, while other "non-critical" aspects of service quality (*assurance*, *empathy*, *tangible*, *satisfaction*, and *promptness*) did not influence their willingness to adopt the online service.

This paper also sheds some light on the role of trust in the internet technology in the willingness of the business users to adopt services that use the technology (online applications). The analysis shows that trust in the technology itself does not necessarily lead to more adoption. Rather, the level of trust in the government that provides the service was more important than trust in the technology itself. This is also evident in the finding that older business users (*years in business*) showed greater willingness to adopt the new technology as their relatively long history of interactions with the government is likely to have established a greater sense of trust in the government, and hence, greater willingness to adopt the online application. Furthermore, the interaction between the perception of high quality offline service and trust in the internet technology did not display any statistically significant impact on the willingness to adopt, further implying that it is not the trust in technology that matters, rather trust in the institution that provides the service.

8. Conclusion

This research began with the premise that successful e-Government practice depends on the extent to which potential users adopt and use online applications to perform various transactions with the government and set out to find factors that influence the decisions of business users in their willingness to adopt the new system of service transaction over the status quo offline service channel. We find that the willingness to adopt e-Government applications depends not merely on the level of trust placed in the internet technology that is used to provide the online services, rather it is based on the level of trust the government has established with its business users through services provided in its traditional brick and mortar service setting. Trust in the internet technology itself was not a sufficient condition of adoption, rather, trust in the government that is using the technology to provide the service was, as it functioned as a stepping-stone for business users to take the risk and explore the benefits of e-Government.

This paper had some limitations. First, since the data were not collected specifically for this study, there are some limitations in the variables we used. For instance, potentially important factors such as parent firm requirement, advice from trusted business partners, firm's IT resources, and a firm's accounting capability can serve as alternative explanations for business users' willingness to adopt online tax filing services. Parent firm policy often constrains business users' behaviors as business users are less likely to adopt the online tax filing

application if online tax filing is not allowed by parent firm policy. Further studies wait for the development of a more comprehensive model of e-Government service adoption by business users. Second, the “willingness” to adopt the online application was used as a measure of adoption (or the likelihood of future adoption). It is unclear whether more “willing” business users in fact made the switch to the online application since at the time of the survey or they all adopted the offline service channel. The survey was conducted only on business users who filed their tax reports offline. A comparable group of business users who filed their tax reports online and measuring their perception of offline service quality before they adopted the online application may add to the validity of the findings here. The survey was limited to business users; therefore findings are limited to business users. Additional study may be necessary to extend the findings here to citizen users.

In spite of those limitations, this study contributes to the existing research and practices in the field of e-Government. The study findings imply that technology may not successfully “push” potential users to adopt e-Government services, rather offline service quality and the trust they place in the government that provides the service “pull” the willingness of the users to adopt e-Government. The internet technology itself is not a sufficient condition for the successful transition into e-Government service provision; instead, high quality service provision in the traditional service channel must be present in order to ensure the willingness and trust of the potential users to adopt the online channel of government services.

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