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Investigating Factors Influencing the Use of E-Government Service

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ABSTRACT

Enhanced telecommunication technologies have enabled Taiwan government to provide businesses and citizens with integrated information and online services. Such technology-based services, often referred to e-government, have substantially advanced the efficiency and accessibility of public services. While the benefits of e-government are widely recognized, the use of online services remains low. The present quantitative study aims to uncover the underlying factors that influence business user adoption of e-government services. In particular, this study integrates the system acceptance model with the trust perspective to investigate the factors that influence business user intentions. Based on the results from questionnaires collected from 204 business users of an online tax payment system, the findings suggest that perceived ease of use has a positive impact on perceived usefulness, that structural assurance influences trust positively, that perceived usefulness, perceived ease of use, and trust have positive impact on attitude, and that trust and attitude influence behavioral intentions positively.

Keywords

E-government, Trust, Technology Acceptance Model

INTRODUCTION

Advanced telecommunication and information technologies such as the Internet and application software have enabled governments to constantly improve service delivery with maximum savings in terms of time and cost. E-government, also known as online government or digital government, refers to the use of information technology to computerize, automate, and deliver public information and services for the benefits of citizens, businesses, and government agencies (Turban et al., 2006). By using information technology, e-government aims at continuously improving the quality of public services available through innovative process designs and governmental transformation.

Taiwan is one of the most computerized societies in the world: a networked readiness index report published by the World Economic Forum ranked Taiwan as number seventeen in the world in 2007-2008. The digital access index report from 2003 reveals that the overall ability of individuals in Taiwan to access and use ICTs was ranked in the top nine and top three in the world and in Asia, respectively. Further, the annual survey conducted by Brown University on online public service constantly ranks Taiwan as one of the top five in the world. These reports indicate that Taiwan is effective in terms of using information technology to deliver public services. Yet, despite the well-established system functions and the expansion in e-services, acceptance of e-government services remains a challenge. A national survey conducted in the year of 2006 indicates that only 36.79% of survey respondents used e-services, and among these only 44.38% were satisfied with the e-government services. In particular, most business users were dissatisfied with the e-government services due to the lack of interoperability between government information systems.

The low system use rate and low user satisfaction oppose the e-government efforts made thus far in Taiwan. The benefits of e-government reside in both process transformation and the use of technology for public services (Wu and Chen, 2005; Belanger and Carter, 2008). As such, the low e-government use rate is critical because it may significantly weaken the efficiency of public service. In particular, the unfavorable business user response requires attention because this group makes

use of a wide variety of e-government services as compared with other types of users. On this basis, the purpose of the current research is to investigate the underpinning factors that influence the acceptance of e-government services by business practitioners.

The technology acceptance model (TAM) is an empirically sound research model with excellent measurement properties (Pavlou, 2003). Previous research has applied TAM to illustrate the factors that influence the user motivation and consequence behavior intention in the use of information systems (Brown and Venkatesh, 2005; Chau and Hu, 2001). This stream of studies suggests that a user's acceptance of information systems depends on his/her perceptions regarding the usefulness and ease of use of those systems. Because e-government involves extensive design and use of information systems, TAM is applicable in the e-government context and is a useful tool to investigate the impact of technical issues on user behavior.

While TAM illustrates the importance of information content and system design on user intentions, this measurement model remains solely focused on system use, and does not take the impact of social factors on user behavior into account. As the Internet makes up the major e-government platform, e-government users frequently concern the risk of online interactions and transactions (Belanger and Carter, 2008). Prior research has designated trust as a key facilitator of web-based interaction and transactions: Yoon (2002) showed that individual trust of a website influences consumers' intention to conduct online transactions. Also, in an investigation regarding user acceptance of an online tax payment system, Wu and Chen (2005) pointed out that trust is one of the key factors that influence the acceptance of e-government.

Realizing that information security and transaction flaws are major obstacles pertaining to online interaction and transaction, the current study integrates both TAM and the trust perspective to explain user decisions regarding the adoption of a web-based tax payment system. The integration of TAM with social factors could significantly improve the theoretical explanatory and predictive power of user intentions (Venkatesh and Davis, 2000). By developing research constructs and a measurement mechanism, this study provides insight into the underpinning factors that drive business practitioners to the continued adoption and use of e-government. Such research is important because it extends the application of TAM and trust from the individual context to the business context. Furthermore, this research reflects the key issues that influences e-government adoption. The remainder of this paper is organized as follows: the next section reviews the literature and related theories, and also lists the research hypotheses. Then, the research method and data collection process are discussed, followed by the results of the quantitative data analysis. Finally, research implications as well as limitations of this study are addressed.

CONCEPTUAL BACKGROUND AND RESEARCH HYPOTHESES

Technology Acceptance Model

The technology acceptance model (TAM) discusses the key issues involved in the use of information systems (Davis, 1989; Brown and Venkatesh, 2005). TAM posits that a user's intention to use information systems is determined by the perceived usefulness and perceived ease of use of the system (Davis, 1989). Further, Davis (1989) defined perceived usefulness as the degree to which a person believes that using a particular system would enhance his/her job performance; perceived ease of use pertains to the level of effort that an individual requires while using an information system. TAM has been applied to investigate user behavior under various user populations and system settings (Al-Gahtani, 2001; Chau and Hu, 2002; Amoako-Gyampah and Salam, 2004; King and He, 2006; Brown and Venkatesh, 2005). In the e-government context, where information technology serves as the primary platform for information and service delivery, user perceptions of the information quality and system features may directly influence their intention to use the online services (Wu and Chen, 2005).

The perceived usefulness of an online tax payment system can be better assessed based on information quality, subjective norms, and system functions (Wu and Chen, 2005). A well-designed information system that is capable of fulfilling user information needs and interactive requirements is likely to reinforce the perceived relevance and usefulness of the system. Subjective norms refer to the impact of important others (e.g., superintendents, peers) on user perceptions of the information systems. Subjective norms have a significant impact on both the perceived usefulness and behavior intentions of users when use of the system is mandatory (Venkatesh and Davis, 2000). Likewise, a well-designed system function that supports the tax declaration process may further reinforce the perceived usefulness of the system. As such, perceived usefulness is one of the key factors that motivate system users to continue to use a system in the future (Davis, 1989; Bhattacharjee and Sanford, 2006). When users believe that e-government services can enhance the productivity and efficiency of business to government (B2G) interaction, they tend to develop positive attitudes toward the system, and consider the use of e-government service as beneficial and useful (Wu and Chen, 2005).

The perceived ease of use is closely related to the quality of user interface and perceived self-efficacy (Wu and Chen, 2005).

In essence, the major purpose of e-government is to simplify the interoperability process to reduce the time and effort required for B2G interaction. A user-friendly interface that minimizes the learning effort can motivate users to continuously explore the functions of information systems. In addition, researchers frequently cite user competence as a key indicator in terms of predicting the effectiveness and efficiency of system use: those who are capable of declaring tax online tend to describe e-government services as easy to use. Such perceptions may further motivate users to engage in additional e-government related activities when B2G interaction is required.

It is likely that the perceived ease of use of the e-government system may enhance the level of perceived usefulness (Venkatesh and Davis, 2000). For example, skills and experience with a given system may enhance user comfort levels such that they become more willing to explore the system functions, which consequently reinforces the perceived usefulness of the system (Ong, Lai, and Wang, 2004). Such a positive perception can further enhance system acceptance. Further, user system proficiency can also affect perceptions of the system support function, as users may upgrade their perceptions of the usefulness of e-government systems due to the familiarity and proficiency levels. Based on the above discussion, we hypothesize:

H1: Perceived usefulness has a positive relationship with attitude towards online tax payment systems.

H2: Perceived ease of use has a positive relationship with attitude towards online tax payment systems.

H3: Perceived ease of use of online tax payment systems has a positive relationship with perceived usefulness of online tax payment systems.

H4: Perceived usefulness of online tax payment systems has a positive relationship with behavior intention regarding online tax payment systems.

Trust

Citizen trust is a cornerstone of the adoption of e-government (Belanger and Carter, 2008). Trust refers to the depth and assurance of feelings based on inconclusive evidence (Doney and Cannon, 1997; McKnight, Choudhury, and Kacmar, 2002). Uncertainty and risk are the necessary conditions that reveal the value of trust (Moorman et al., 1993).

Trust is imperative in terms of the acceptance of e-government services due to the unique distant and impersonal nature of the Internet. Web-based e-services often raise concerns regarding the intrusion of personal privacy and the invasion of transactional information. In light of the inherent uncertainty associated with revealing personal information over the Internet and concerns regarding transaction fraud, users need to be assured that e-services are secure. Thus, despite the fact that e-government has improved B2G effectiveness and productivity, e-service is likely to become a common business practice if and only if the users consider the system to be reliable and trustworthy (Belanger and Carter, 2008). In other words, trust is one of the cornerstones in terms of influencing user attitudes toward e-government services.

Numerous research studies have investigated the impact of trust in the context of e-commerce (Gefen, Karahanna, and Staub, 2003; Liu, Marchewka, Lu, and Yu, 2004; McKnight and Chervany, 2002). However, few empirical studies have attempted to investigate the impact of trust in the e-government context by including trust in TAM. Of those, Wu and Chen, (2005) empirically validated the significant influences of trust on user attitudes and consequent behavior intentions towards e-government services. All of the findings thus far suggest a positive relationship between trust and user attitudes towards e-service.

Further, e-commerce researchers have explored the trust development process. Moorman, Rohit, and Gerald (1993) divided the process of trust development into antecedents, trust, and behavioral intentions. Antecedents of trust refer to elements that determine the formation of trust. Personal traits, structural assurance and situational normality of the Web, initial impressions, and personal interactions are important factors that trust is derived from (McKnight et al., 1998). In the context of e-government, where the Internet is the major operational platform, structural assurance and situational normality of the Web are especially important. Structural assurance is often labeled as institutional-based trust. This type of trust refers to the individual's perceptions of the regulation and structure that makes the environment safe (McKnight and Choudhury, 2002). For example, the security mechanism that protects the data transmission and the privacy policy pertaining to the acquisition and dissemination of private information are essential in terms of building up user trust (Gefen, Karahanna, and Staub, 2003). Belanger and Carter (2008) highlighted the importance of institutional-based trust and suggested that users tend to adopt e-government systems when they believe that government is capable of providing accurate information and secure transactions.

Moreover, trust can be gained based on the confidence demonstrated by the trustee's ability, benevolence, predictability, and integrity in uncertain circumstances, such as cyber interaction (Gefen, 2000). Behavioral intentions reflect the scope and depth of relationships. McKnight and Chervany (2002) point out that when users develop trust in a website, they tend to continue participating and conducting transactions with the content provider. Liu et al. (2004) suggest that trust can lead to repeat website visits and website recommendations. Thus, users' confidence in government agencies to provide reliable systems and to protect and respect their private data has a strong impact on the adoption of e-government. As such, user trust not only influences user attitudes toward e-government systems, but can also influence behavior intentions. Hence, we propose:

H5: Structural assurance of online tax payment systems is positively associated with user trust.

H6: User trust is positively associated with attitude of online tax payment systems.

H7: User trust is positively associated with behavior intentions regarding online tax payment systems.

RESEARCH DESIGN

Questionnaire Design and Pilot Study

This study adopted the quantitative research method to investigate the key factors that influence the intention of business users to file tax reports via a web-based tax payment system. The quantitative research method is capable of verifying theoretical constructs and investigating the relationships between variables.

The questionnaire was comprised of two sections: section I concerned the background information of the business users, including number of employees and number of online payments. The purpose of this section was to develop organizational profiles of the respondents. Section II included important questions pertaining to perceived usefulness, perceived ease of use, structural assurance, trust, attitudes, and behavioral intentions. The measurement indicators were derived from the research literature and empirical research. All measurement indicators were empirically tested for validity and reliability.

Construct validation and a pilot test were performed to ensure the effectiveness of the questionnaire items. According to Carmines and Zeller (1979), validation involves three major steps: theoretical validation, empirical validation, and construct validity. In this study, the initial constructs were validated via academic research studies. In order to ensure that the content of the questionnaire was appropriate and clear, the research team also invited an academic expert and a government officer to review the questionnaire.

Fifty-eight business users who had previously used online tax payment systems assisted with the pre-test. Cronbach's α was applied to test the consistency of the measurement constructs. A Cronbach's alpha of 0.6 or higher is commonly considered as a benchmark for reliability testing (Cuieford, 1965). The Cronbach's alphas of the pre-test were greater than 0.7 across all measurement variables.

Research Sample

This study targeted business users who use the online tax payment system for tax declarations. Manufacturing industry firms were selected for our sample as they are one of the most active business sectors in Taiwan. To ensure data validity, accounting or finance managers were requested to complete the questionnaires, as this group should be the most knowledgeable regarding corporate tax declarations. The research sample firms were drawn from the top 1000 companies in Taiwan. A mailing list of accounting and finance managers was acquired from publicly available resources. In general, the selected firms shared two common characteristics: all were medium- to large-size firms and had frequently employed B2G e-government services. The data collection was conducted from for a total duration of two months near the end of 2007. The data collection process followed the suggestion of Dillman (2000) in terms of conducting multiple contacts with respondents. A total of 820 firms were contacted to seek their participation in this study, and 206 of them responded to our request. After discarding two questionnaires with missing values, we were left with 204 effective responses, for a response rate of 24.88%.

DATA ANALYSIS

Descriptive Statistics

Table 1 summarizes the characteristics of the respondents. Descriptive data from the statistical analyses revealed that 53.4% of the responding firms had more than 500 employees, while 25% of the responding firms had more than 1000 employees worldwide. Furthermore, 49% of the responding firms used online tax payment systems more than 20 times a year.

Number of employees	Frequency	Percentage
50-100	5	2.5%
101-200	42	20.6%
201-500	48	23.5%
501-1000	58	28.4%
1001-5000	40	19.6%
> 5000	11	5.4%
Number of online tax payments	Frequency	Percentage
< 5	16	7.8%
5-10	30	14.7%
11-20	58	28.4%
21-100	74	36.35%
> 100	26	12.75%

Table 1. Demographics of Respondents

Analysis of Measurement Model

A confirmatory factor analysis was used to validate the measurement instruments. Discriminant validity is deemed acceptable when the average variance extracted (AVE) by each construct is larger than 0.5. The measurement construct was also deemed reliable because all the factor loadings were greater than 0.5 (Hair, Black, Babin, Anderson, and Tatham, 2006). Furthermore, the composite reliability was greater than 0.8, indicating internal consistency of the measurement constructs. Table 2 summarizes the correlation matrix of all variables, while Table 3 presents the statistical outcomes of the measurement constructs and factor analysis.

Measurement Construct	Perceived Usefulness	Perceived Ease of Use	Attitude	Behavior Intention	Trust	Structural Assurance
Perceived Usefulness	0.72					
Perceived Ease of Use	0.33	0.85				
Attitude	0.68	0.60	0.78			
Behavior Intention	0.54	0.39	0.80	0.82		
Trust	0.56	0.56	0.83	0.75	0.91	

Structural Assurance	0.26	0.30	0.43	0.41	0.54	0.93
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Table 2. Correlation Matrix

Measurement Construct	Factor Loading	SMC	CR	AVE
Perceived Usefulness (Venkatesh and Davis, 2000)				
Using the tax payment system enhances my efficiency when filing a tax declaration.	0.78	0.61	0.8139	0.5225
Using the tax payment system increases my productivity when filing a tax declaration.	0.75	0.56		
Using the tax payment system helps me to file a tax declaration.	0.67	0.45		
I find the system to be useful when filing a tax declaration.	0.69	0.47		
Perceived Ease of Use (Venkatesh and Davis, 2000)				
My interaction with the tax payment system is clear and understandable.	0.87	0.75	0.9129	0.7225
Using the tax payment system does not require a lot of effort.	0.83	0.68		
It is easy to get the system to do what I want it to do.	0.84	0.70		
I find the tax payment system to be easy to use.	0.87	0.76		
Attitude (Wu and Chen, 2005)				
Using the tax payment system saves effort when filing a tax declaration.	0.66	0.44	0.8565	0.6025
Using the tax payment system has more benefits than drawbacks.	0.84	0.71		
Using the tax payment system is a pleasant experience.	0.73	0.53		
Using the tax payment system is a wise idea.	0.85	0.73		
Trust (Wu and Chen, 2005)				
Based on my perceptions of the tax payment system, I know it is predictable for the service.	0.87	0.76	0.9135	0.68
Based on my perceptions of the tax payment system, I believe it provides good service.	0.85	0.73		
Based on my perceptions of the tax payment system, I believe it provides high information quality.	0.86	0.74		
Based on my perceptions of the tax payment system, I believe it is reliable.	0.75	0.56		
Based on my perceptions of the tax payment system, I believe it helps business users to file their tax declaration.	0.78	0.61		
Behavior Intention (Davis, 1989)				
I am willing to use the tax payment system to file a tax declaration.	0.94	0.88	0.9315	0.82
I consider the tax payment system to be one of major options in terms of filing a tax declaration.	0.95	0.91		
I am willing to recommend the tax payment system to my co-workers.	0.82	0.67		
Structural Assurance (McKnight et al., 2002)				
I believe the tax payment system employs adequate security mechanisms to protect my personal information.	0.91	0.83	0.9602	0.8575
I believe the tax payment system employs adequate encryption techniques that secure the data transmissions.	0.95	0.91		
I believe the tax payment system provides a secure transaction platform.	0.95	0.89		

Table 3. Measurement Construct and Factor Analysis

Assessment of the research model was conducted using the structural equation model (SEM). The measurement model showed a good model fit (Hair et al., 2006) with values within a reasonable range. Table 4 presents the indices of the model fit.

Goodness-of-fit analysis	criteria	Index	Reference
$\chi^2 / d.f$	-	360.82/229	-
$\chi^2 / d.f$	≤ 3	1.576	Bagozzi and Yi (1988)
GFI	≥ 0.8	0.87	Doll, Xia, and Torkzadeh (1994)
AGFI	≥ 0.8	0.83	Doll et al. (1994)
NFI	≥ 0.9	0.97	Hair et al. (2006)
CFI	≥ 0.9	0.99	Hair et al. (2006)
RMSEA	≤ 0.08	0.053	Hair et al. (2006)

Table 4. Model Fit Analysis

Path Analysis

LISREL, widely applied to analyze latent constructs and explain the relationships between and variance of multiple variables, was used to conduct the SEM analysis. Figure 1 presents the results of the structural analysis. User attitude was jointly predicted by perceived usefulness (0.37, $t = 4.71$, $p < 0.001$), perceived ease of use (0.28, $t = 4.23$, $p < 0.001$), and trust (0.65, $t = 7.85$, $p < 0.001$) and these variables explained 80% of the variance on user attitude ($R^2 = 0.80$). This research finding was consistent with the view of Wu and Chen (2005), who highlight the importance of perceived usefulness, perceived ease of use, and user trust on system adoption. Therefore, government agencies should consider developing a well-integrated information system with advanced security protection to motivate business users to engage in online tax declarations.

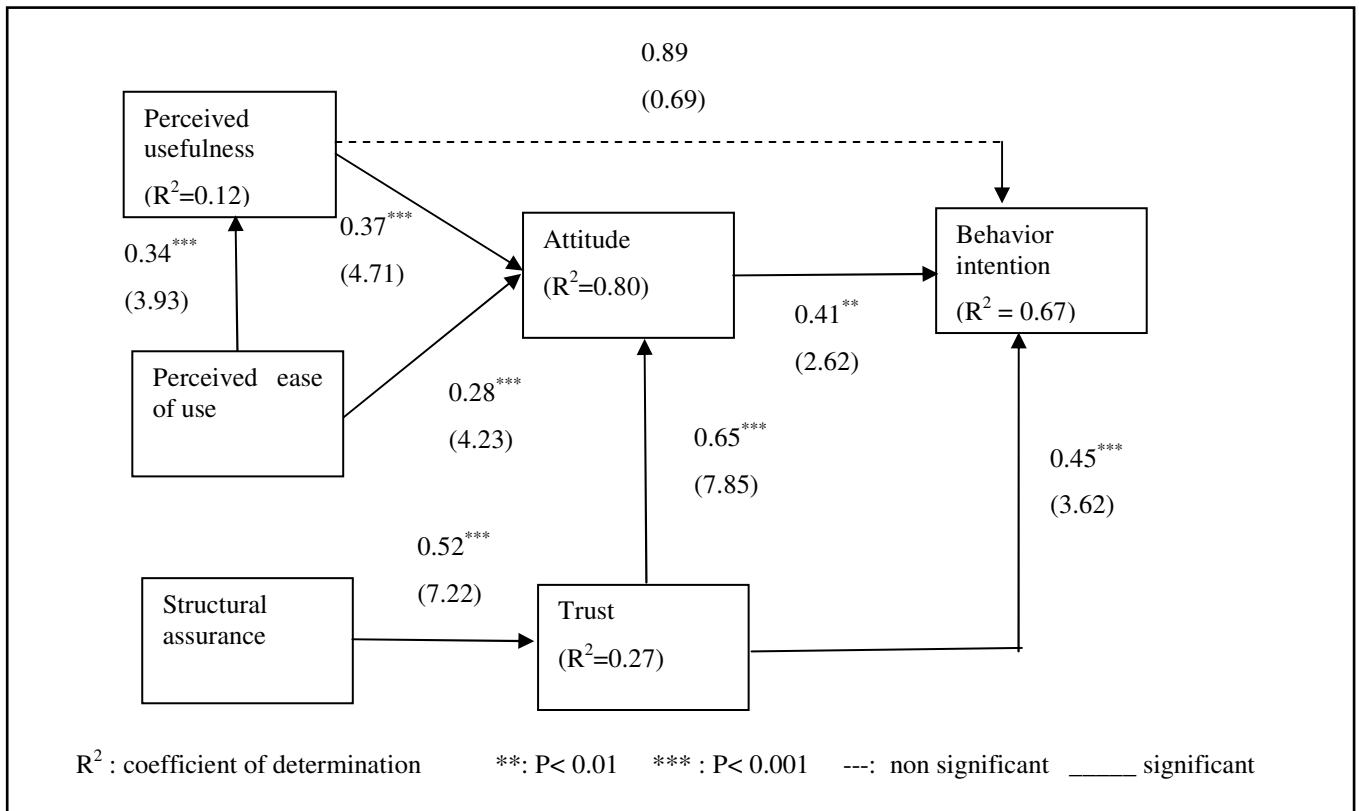


Figure 1. Model Testing Result

Furthermore, user attitude (0.41, $t=2.62$, $p<0.01$) and trust (0.45, $t=3.62$, $p<0.001$) were two important influences in terms of business users' intention to use an online tax payment system, and these two variables explained 67% of the variance on behavior intentions. It is interesting to note that trust played a more influential role on user intentions than did user attitude. This finding supplements prior research to the extent that system functions play only a partial role in determining user intention to conduct online tax declarations. Government agencies should take into account the impact of trust and emphasize the elimination of uncertainty and risk associated with online tax payments.

In terms of trust, previous studies investigating online consumer behavior have highlighted the trust building process (McKnight et al., 2002). Our findings indicate that structural assurance (0.52, $t=7.22$, $p<0.001$) was an important antecedent to building user trust. However, the research result reveals that structural assurance only explained 27% of the variance on user trust. Thus, in addition to the adoption of advanced security mechanisms to safeguard users' information, government agencies should also endeavor to satisfy user needs and formulate public policies that protect system users.

The results also indicate a positive impact of perceived ease of use (0.34, 3.93, $p<0.001$) on perceived usefulness. This finding is consistent with prior empirical research (Davis 1989) and supports the view that a user-friendly system interface and design are essential to enhance the perceived usefulness of the system. Thus, governments should consider continuous refinements to the system functions and content of their e-government services.

DISCUSSION

Research Implications

The purpose of this research study is to gain a better understanding of the underlying factors driving the business user adoption of online tax payment systems. Integrating the technology acceptance model with trust theory, this research tests the impact of perceived usefulness, perceived ease of use, and trust on user attitudes and the intention to use online tax payment systems. In addition, this study also tests the impact of structural assurance on user trust. There are three major research implications based on the results.

First, consistent with prior research, the results suggest that perceived usefulness and perceived ease of use play influential roles in terms of user decisions regarding the adoption of online tax payment systems. This finding is consistent with prior empirical research (Wu and Chen, 2005; Ong et al., 2004) and supports the conventional view that system design and system functions are important factors that motivate users to adopt e-government services. Thus, governments should continuously refine the user-interface and system functions to support online tax payments. It is worth noting that the impact of perceived usefulness on user attitudes is not significant. A possible explanation for the lack of support for this relationship is that most of the business users hire professional accountants to take care of the tax filing. As such, the perceived usefulness of the online tax payment system does not play a large role on subsequent decisions regarding system adoption and use. Perceived usefulness can, however, influence user intentions via the development of positive user attitudes.

Second, the impact of trust on user attitudes and user intentions is significant and consistent with previous research (Wu and Chen, 2005, McKnight et al., 2002; Belanger and Carter, 2008). The significant role of trust indicates that most system users are concerned about the uncertainty and risk associated with online transactions and interactions, and thus hesitate to use online tax payment systems to make tax declarations. This result implies that governments should consider adopting security mechanisms to enhance the perceived information control and information security.

Finally, the impact of structural assurance on trust is significant and also consistent with previous research (McKnight et al., 2002; Belanger and Carter, 2008). Structural assurance refers to the use of structures that include regulations, guarantees, promises, and legal remedies associated with the website design to promote trust. Our results indicate that structural assurance predicts 27% of the variance associated with trust, which implies that governments should develop more secured systems, and at the same time also provide legal protection regarding user data and tax information. Furthermore, the results indicate that this study only identifies one influential antecedent of trust. Thus future research should explore other factors or issues that may also contribute to user trust.

Limitations and Future Research

This study faced two major research limitations. First, this research targeted business users without considering their level of involvement in e-government services. A critical concern is that the prior e-government service experience may influence

their perceptions of the quality of e-government services and thus influence their intention to use the online tax payment system. In addition, subjective norms may also have played an influential role in terms of the attitude of business users toward system adoption. Future research should take into account the impact of subjective norms and user experience on user intentions in the context of e-government. Furthermore, because the research focus was limited to Taiwanese firms only, the results cannot be applied globally. Future research is needed to investigate if culture plays a role on user perceptions within the e-government context.

Second, this research focused on the impact of structural assurance on trust only, without considering the impact of user satisfaction and service quality. Future research should investigate the influence of user experience and the perceived effectiveness and efficiency of e-government services. In addition, future research should be undertaken to further explore the potential dimensions of trust antecedents within the e-government context.

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