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Influence of System Traits and Personal Traits on the Acceptance of e-Government Service

¹Supaporn Chomchalao and ²Thanakorn Naenna

¹Technology of Information System Management, Faculty of Engineering,
Mahidol University, Nakhonpathom 73170, Thailand

²Department of Industrial Engineering, Faculty of Engineering, Mahidol University,
Nakhonpathom 73170, Thailand

Abstract: As governments can provide various benefits to their citizens from the use of information technologies, this study aims to investigate both the system traits and personal traits that affect citizens' decision to use e-government service. The Technology Acceptance Model (TAM) was used to understand the factors that influence citizens' willingness to use e-government service. Data were collected from a sample of 400 users of the G2C e-government service to test a model. The results found that the factors with a significant effect on perceived usefulness are: system quality, information quality, service quality, social influence and perceived ease of use. While the factors positively contributing to perceived ease of use are: system quality, service quality, self-efficacy and personal innovativeness in IT. In addition, both perceived usefulness and perceived ease of use were found to enhance e-government service use. Perceived usefulness was the most important factor in predicting citizens' intention to accept the use of e-government service.

Key words: E-government, technology acceptance model, DeLone and McLean model (D and M model)

INTRODUCTION

With the development of information technology, governments can make use of this to provide information and services to their citizens in better ways. E-government is one of the applications from Information and Communications Technology (ICTs), which has been changing the way that governments and citizens interact (Akman *et al.*, 2005). There are several advantages of e-government services applications, such as improving accountability, transparency, convenience, efficiency and citizen involvement and decreasing costs and corruption (Tung and Rieck, 2005). E-government allows users conveniently and easily access to government services or desired information anywhere and at any time.

To enhance citizens' satisfaction, several governments around the world have been providing information and services online. The internet has become one of the channels that governments increasingly exploit to communicate with their citizens and businesses (Reddick and Frank, 2007). Four types of e-government systems have been included in this study: government to government (G2G), government to business (G2B), government to employee (G2E) and government to citizen (G2C) (Carter and Belanger, 2003). The aim of this study

was to understand the factors leading to citizen acceptance, to explain and predict their intention toward the G2C e-government context. G2C e-government is similar to B2C in e-commerce in that citizens can connect directly to websites to access the information they need (Chang *et al.*, 2005). There are a wide range of services available on these websites, e.g., tax-return filing, vehicle registration renewal, received payment and printable forms.

The number of internet users in Thailand increased from 2004 to 2008. Internet users in Thailand climbed from 6.97 million in 2004 to 10.96 million in 2008 (United Nation, 2008). However, these numbers still only represent 18.2% of Thailand's total population. This means 81.8% of Thai people were unable to receive any benefits from e-government service. According to a survey of True Hits Statistics on website usage in Thailand, there was a very low percentage of e-government usage (1.05%) based on total internet users Thailand Web Directory and Advance Web Statistics.

The survey of the National Electronics and Computer Technology Center (NECTEC) reveals that all 267 Thai government agencies had their own websites to provide information (NECTEC, 2005). However, if citizens do not know of e-government services or do not access the

website to use it, these services will be valueless. The current status of users' behavior in regard to e-government, especially for Thai people has barely been known. Thereby, understanding the motivation of both citizens and business organizations in using e-government service is important (Tung and Rieck, 2005), as is increasing online public service usage. The results regarding citizens' acceptance can be used as a guideline for the Thai government to develop available services and to improve the potential of e-government.

This study was conducted based on the Technology Acceptance Model (TAM), while the three factors of the DeLone and McLean model (system quality, information quality and service quality), as well as self-efficacy, facilitating conditions, social influence and personal innovativeness in IT were considered as external variables to identify the factors that affect citizens' intention. Characteristics that affect e-government usage were classified into two categories: (1) System traits and (2) Personal traits. Both system traits and personal traits can significantly influence the willingness of citizens to use e-government, by determining if it is useful and easy to use. As a result, a multiple regression was employed to test the relationships among the factors in the research model.

THEORETICAL BACKGROUND

Current situation of e-government in Thailand: Thailand has had an IT policy since 1996. In the past, Thailand has had two IT policies: IT 2000 and IT 2010. The Thai government spent many million baht to invest in various projects to improve efficiency. The government has approved 1,095 IT projects with a total budget of 28,436.25 million baht in 2003. In 2004, the number of projects dropped to 1,078, while in 2005 the total budget was significantly increased to 60,408.62 million baht (NECTEC, 2005).

Since, 2005, the e-Government Readiness Index (EGDI) in Thailand has been moved down. United Nations e-government survey, the e-government readiness index rank for Thailand was 64th from 192 countries; falling from 46th in 2005 (United Nation, 2008). The survey weighted the average composite index base on the web measure index, telecommunication infrastructure index and human capital index.

According to the Global e-government annual report, which reviewed 1,667 government websites in 198 countries, Thailand was ranked 138th, with a score of 27.9, with the index scale ranging from 0 to 100 (West, 2008). The report analyzed 18 different features of e-government.

The top five ranking countries were South Korea, Taiwan, the United States, Singapore, Canada and Australia.

Technology acceptance model: The Technology Acceptance Model (TAM) is concerned with the adaptation of the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975), which was proposed by Davis (1989). The Technology Acceptance Model (TAM) is a conceptual model to explain and predict the adoption by users of Information Technology (IT). The TAM proposes that the two important determinants when users decide to use information technology are: perceived usefulness and perceived ease of use. Perceived usefulness refers to "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989), while perceived ease of use refers to "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989).

Users' perceived ease of use of an information system is a determining factor in whether users will decide to make use of it (Gu *et al.*, 2009) and perceive usefulness and attitude a direct influence on users' intention toward the technology. Perceived ease of use affects users' attitudes toward using and perceived usefulness. Two beliefs which affect individual attitudes towards using information technology are the intention of the user, which in turn increases usage of the technology.

In the past, TAM was applied to examine acceptance in relation to various types of technologies including on-line tax programs (Wu and Chen, 2005), e-commerce (Qiu and Li, 2008), internet banking (Lee and Kim, 2009), instant messaging (Lu *et al.*, 2009), information systems (Diez and McIntosh, 2009), health care applications (Aggelidis and Chatzoglou, 2009) etc. TAM has been used to predict user acceptance of e-government as well (Carter and Belanger, 2005).

Extending TAM: Davis (1989) proposed that for future research of technology acceptance external variables that could lead to easier use and useful of TAM should be added; also suggested by Moon and Kim (2001) was the necessity of TAM to increase external variables that fit the context of technology. Several researches have integrated external variables into TAM such as playfulness (Moon and Kim, 2001), perceived quality (Liao and Tsou, 2009) self-efficacy (Hsu *et al.*, 2009; Luarn and Lin, 2005; Hernandez *et al.*, 2009; Wang, 2003), perceived credibility (Chang *et al.*, 2005; Wang, 2003), perceived financial resources (Wang, 2003) and enjoyment (Ha and Stoel, 2009). For the descriptions shown in Table 1, determinants were increased to TAM

Table 1: Research of extended TAM

Studies	Technologies	Sample	TAM	Antecedents
Moon and Kim (2001)	WWW	152 Graduate students	Perceived usefulness, perceived ease of use, attitude, behavioral intention, actual usage	Perceived playfulness
Liao and Tsou (2009)	Computer mediated communication	211 Users	Perceived usefulness, perceived ease of use, attitude, usage	Perceived playfulness, perceived quality
Hsu <i>et al.</i> (2009)	Statistical software	207 Online MBA students	Perceived usefulness, perceived ease of use, behavioral intention	Statistical software self-efficacy, computer attitude, statistical anxiety
Luam and Lin (2005)	Mobile banking	180 Respondents	Perceived usefulness, perceived ease of use, behavioral intention	Perceived credibility, perceived self-efficacy, perceived financial cost
Hernandez <i>et al.</i> (2009)	E-purchasing behavior	225 Experienced e-shoppers	Perceived usefulness, perceived ease of use, attitude	Acceptance of the internet, frequency of internet use, satisfaction with the internet, perceived self-efficacy, present behavior, future repurchasing behavior
Wang (2002)	E-tax filing systems	260 Users	Perceived usefulness, perceived ease of use, behavioral intention	Perceived credibility, computer self-efficacy
Chang <i>et al.</i> (2005)	E-tax filing systems	141 Experienced taxpayers	Perceived usefulness, Perceived ease of use, attitude, behavioral intention	Information system quality, information quality, perceived credibility
Wang <i>et al.</i> (2006)	Mobile service	258 Users	Perceived usefulness, Perceived ease of use, behavioral intention	Self-efficacy, perceived financial resource, perceived credibility
Ha and Stoel (2008)	E-shopping	298 College students	Perceived usefulness, Perceived ease of use, attitude, behavioral intention	E-shopping quality, enjoyment, trust

for predictive behavior intention to use for a variety of information technology. For this study, the variables of system quality, information quality, service quality, facilitating conditions, self-efficacy and social influence have been added as extensions to the TAM in order to predict the determinants that relate to user intention and result in actual e-government service usage.

DeLone and McLean’s IS success model: The Information System Success model is a theoretical model designed to explain the success of information technology, which was developed by DeLone and McLean (1992). System quality, information quality, IS use, user satisfaction, individual impact and organizational impact are the six determinants of IS success. In the model, use and user satisfaction are affected by system quality and information quality. Both use and user satisfaction were determined to affect the user when using the information technology. As a result, the organizational impact for a user that uses an information system and the model is interrelated among the six dimensions.

Pitt *et al.* (1995) adapted the Information System Success model by adding new factors to measure information systems, namely service quality. DeLone and McLean proposed an updated IS success model later in 2003. Service quality was added to the IS success model as a new dimension to measurement information system success. Employing intention to use has impact on user satisfaction that is associated among six determinants. The system quality, information quality and service quality are found to affect user satisfaction, intention to use and use and result in net benefits when using the system. In this study, the included system characteristic dimensions were the set of system quality, information quality and service quality. These were adapted to the

research model to measure the G2C e-government service for investigation of the perceptions of citizens.

Prior research on e-government service acceptance:

Many researchers have been investigating factors that influence citizen’s acceptance of e-government service. The Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB) and Diffusion of Innovation (DOI) are the theoretical frameworks used to predict user acceptance of various technology and also used to predict citizen’s perception of the e-government context. Wang (2003) extended TAM to the e-tax filing system by adding perceived credibility and computer self-efficacy to the research model. Their findings indicate that all measured factors support citizens’ intention to use e-government service. Chang *et al.* (2005) also investigated the factors that influence citizens’ intention toward e-tax filing. They used information system quality, information quality and perceived credibility as the external variables of TAM. Their research indicates that all these factors support citizens’ intention. Carter and Belanger (2005) integrated TAM and DOI with a web trust model to explore factors that lead to citizen intentions. Their findings indicate that perceived ease of use, compatibility and trustworthiness significantly affect citizens’ intention. Wu and Chen (2005) extended TAM with TPB and added Trust to online tax context. Their findings indicate that all factors have been supported by citizens’ intention but the effects of perceived usefulness and subjective norms on intention are not significant. Fu *et al.* (2006) integrated TAM and TPB to study factors that affect e-tax filing intention. The research indicates that compatibility positively relates to perceived ease of use and perceived usefulness. In addition, perceived ease of use, perceived usefulness, subjective norms and

self-efficacy all have a positive influence on intention to use e-government. Hung *et al.* (2006) studied the use of online tax filing and payment systems in Taiwan. The Theory of Planned Behavior (TPB) has been used to investigate citizens' intention to accept the technology. They found perceived usefulness, perceived ease of use, perceived risk, trust, compatibility, external influences, interpersonal influence, self-efficacy and facilitating conditions significantly affect citizens' intention to make use of the service. Lee and Rao (2009) studied the different levels of task complexity of e-government service; their results indicate that task complexity is important to citizens' behavioral intentions. Hung *et al.* (2009) studied this by using the Theory of Planned Behavior (TPB) to predict factors that influence users' intention to use intergovernmental services. Their findings indicate that perceived usefulness, perceived ease of use, training, compatibility, external influence, interpersonal influence, self-efficacy and facilitating conditions directly affect intergovernmental intentions. This study added system traits and personal traits as external variables on TAM to explore factors that lead to citizen acceptance of e-government service.

RESEARCH MODEL AND HYPOTHESES

In this study, the research model and hypotheses were developed based on the technology acceptance

model. The influence of two major attributes, system traits and personal traits, were taken into the research model to investigate users' acceptance of e-government services, which are explained by external variables (system quality, information quality, service quality, facilitating conditions, self-efficacy, social influence and personal innovativeness in IT). The model was shown in Fig. 1.

System traits of e-government service: System quality refers to a system's efficiency in producing and delivering information and services to users. Many studies have developed measures of system quality: reliability, flexibility, ease of use, functionality, data quality, importance, integration and portability (DeLone and McLean, 2003); interactivity and accessibility (Negash *et al.*, 2003) and flexibility, interoperability and functionality (Bernroider, 2008). System quality in this study was classified as an aspect of e-government service and was identified in four dimensions: ease of navigation, availability, response time and security. A high level of system quality should improve users' ability to conveniently access e-government service; as many studies have supported the idea that system quality significantly affects perceived usefulness and perceived ease of use (Ahn *et al.*, 2007) accordingly, we propose the following hypotheses:

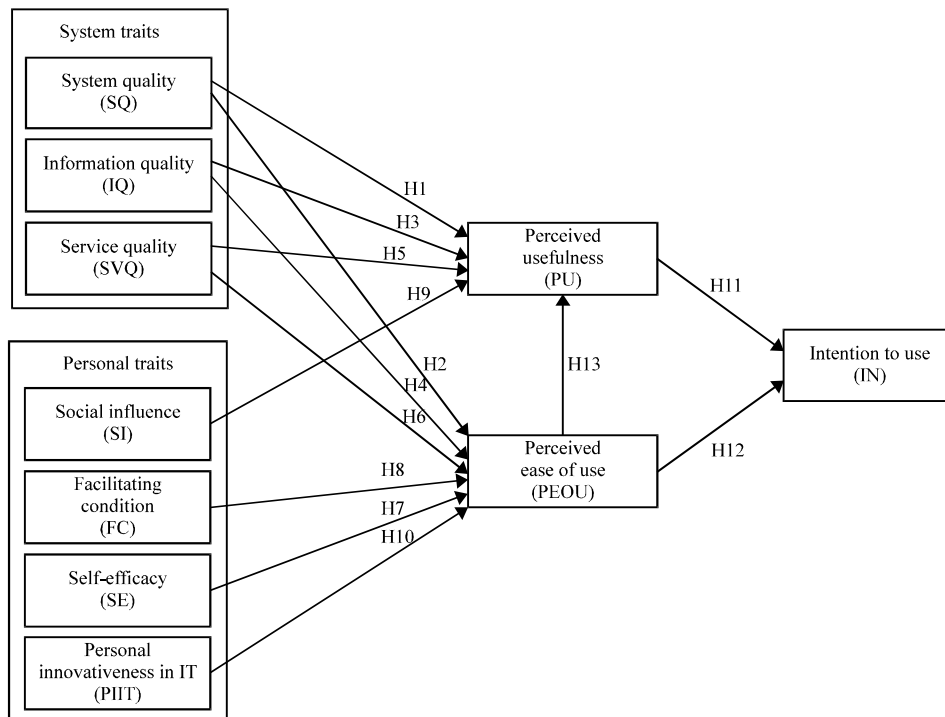


Fig. 1: Research model

- H1:** System quality of e-government has positive effects on the perceived usefulness of e-government service
- H2:** System quality of e-government has positive effects on the perceived ease of use of e-government service

Information quality refers to the information that a system provides to users through its website. A wide range of measurements has been developed to determine information quality in terms of timeliness, accuracy, relevance, consistency and completeness (DeLone and McLean, 2003). In this study, information quality was identified in four aspects; contents, accuracy, timeliness and information. From various studies, it has been found that information quality directly influences perceived usefulness and perceived ease of use (Ahn *et al.*, 2007). Therefore, a high level of information quality is one aspect that enhances users' intention to use through perceived usefulness and perceived ease of use. Therefore, it follows that:

- H3:** Information quality of e-government has positive effects on the perceived usefulness of using e-government service
- H4:** Information quality of e-government has positive effects on the perceived ease of use of e-government service

Service quality is considered to be the quality of service that the system provides to support its users. SERVQUAL is the instrument used to measure service quality developed by Parasuraman *et al.* (1988), for measuring quality of service according to users' perceptions. SERVQUAL consists of 22 items which can be classified into five categories, which are tangibility, empathy, reliability, responsiveness and assurance. Zeithaml *et al.* (2002) used e-SERVQUAL to measure electronic service quality. In 2005, Parasuraman *et al.* (2005) developed E-S-QUAL for measuring the service quality of websites as identified by four dimensions, which include 22 scale items, focusing on customers' perception in an online store context. Service quality in this study was focused on the quality of service that e-government provides to citizens. Service quality is crucial for online e-government service, since it can enhance the perceived ease of use and the perceived usefulness to citizens. Therefore, it follows that:

- H5:** Service quality of e-government has positive effects on the perceived usefulness of e-government service
- H6:** Service quality of e-government has positive effects on the perceived ease of use of e-government service

Personal traits of citizens: Self-efficacy was defined as the "belief of the individual in his or her own capacity to affect a specific behavior" (Bandura, 1982). When individuals have more self-efficacy, they are more likely to develop the ability to use more sophisticated information systems by themselves, without support from others. Self-efficacy is an external variable included in TAM to predict individuals' behavior (Taylor and Todd, 1995; Hernandez *et al.*, 2009). In this study, self-efficacy was considered in the context of e-government service and was defined as an individual's ability to access and complete a desired task using the e-government service on their own. From previous research, self-efficacy positively related to perceived ease of use such as mobile banking (Gu *et al.*, 2009), e-purchasing (Hernandez *et al.*, 2009) and e-stores (Venkatesh, 2000). The researchers therefore propose the following hypothesis:

- H7:** Self-efficacy of citizens has positive effects on the perceived ease of use of e-government service

Facilitating conditions or resources are the factors that help people to easily perform and accomplish their tasks (Thatcher *et al.*, 2007). The facilitating conditions in this study were defined as individuals having sufficient resources to utilize the e-government service. Although facilitating conditions as studied by Taylor and Todd (1995) were divided in two contexts: resource facilitating conditions and technological facilitating conditions; this study focused on facilitating conditions from a resource context. There are a number of barriers to adoption of e-government such as time, money, financial security, trust and information quality (Gilbert *et al.*, 2004). Previous research has indicated facilitating conditions significantly affect the perceived ease of use (Gilbert *et al.*, 2004; Taylor and Todd, 1995). Therefore, it follows that:

- H8:** Facilitating conditions have positive effects on the perceived ease of use of e-government service

Social influence is defined as "a person's perception that most of the people who are important to him think he should or should not perform the behaviour in question" (Fishbein and Ajzen, 1975). Correspondingly, in the context of e-government, social influence in this study was in reference to "people who are important to an individual and the have opinion that he or she should or should not use the e-government service". There is a high chance that an individual will come to a decision to use e-government service when members of their social network e.g., family members, relatives and friends

recommend the service. In several previous research studies, social influence has a direct effect on perceived usefulness (Taylor and Todd, 1995). It is therefore, hypothesized that:

H9: Social influence has positive effects on the perceived usefulness of e-government service

Personal innovativeness refers to a user's determination or willingness to try out new Information Technology (IT). A new concept to measure Personal Innovativeness in IT (PIIT) was developed by Agarwal and Prasad (1998) to effectively explain acceptance of information technology. Personal innovativeness enhances a user's intention to use information technology. From several past research studies, it was found that personal innovativeness has a positive effect on perceived ease of use in 3G mobile value-added services (Kuo and Yen, 2009), wireless internet services via mobile technology (Lu *et al.*, 2005) and wireless mobile services (Lu *et al.*, 2008). Therefore, an increase in perceived personal innovativeness in IT will enhance user perceptions about ease of use. Therefore, it follows that:

H10: Personal innovativeness in IT has positive effects on perceived ease of use of e-government service

Perceived usefulness is defined as "the degree to which a person believed that using a particular system would enhance his or her job performance" (Davis, 1989). A useful system effectively supports citizens when they use the e-government and encourages them to use it. When a technology is perceived as very useful, it is believed to offer great performance for its users (Hernandez *et al.*, 2009). An increase in perceived usefulness has been linked to increased behavioral intention (Taylor and Todd, 1995; Moon and Kim, 2001). Perceived usefulness will be increased when citizens perceive that a service improves their work efficiency, in making tasks such as searching for information and conducting transactions more convenient. From this, we hypothesized that:

H11: Perceived usefulness of e-government has positive effects on intention to use e-government service

Perceived ease of use is defined as "the degree to which a person believes that using a particular system will be free of effort" (Davis, 1989). Several prior studies have supported the idea that perceived ease of use has positive effects on perceived usefulness (Lu *et al.*, 2009; Lee *et al.*, 2009) and intention to accept (Moon and Kim, 2001; Jung *et al.*, 2009; Lu *et al.*, 2009). This study

focused on perceived ease of use in an e-government service context. The perceived ease of use of e-government service will increase when citizens feel that is it easy to use. Therefore, it follows that:

H12: Perceived ease of use of e-government has positive effects on citizen's intention to use e-government service

H13: Perceived ease of use of e-government has positive effects on perceived usefulness of e-government service

RESEARCH METHODOLOGY

Data collection: The questionnaires consisted of two parts. The first part included the basic information of respondents and second part was comprised of questions on factors influencing the intention to use e-government, which measured 10 factors in total. Data was gathered using a self-administered questionnaire to test the hypotheses. Questionnaires were distributed to 400 respondents who are internet users in Bangkok. The respondents were asked to participate in the study regardless of their experience using the e-government service. They were then requested to select the most frequently visited e-government website from a list of five G2C systems: Thailand internet tax payment (<http://www.rd.go.th>), electronic motor vehicle and driver system (<https://www.dlte-serv.in.th>), e-government portal (www.ecitizen.gov.sg), government e-service citizens (<http://www.khonThai.com>) and job matching (www.doe.go.th). However, if the respondents had no experience of the websites listed in the questionnaire, the name of other websites that they had visited could be given as a replacement. Respondents who did not fill in the name of any visited websites were eliminated from the analysis. e-government services in the questionnaires were aimed to represent the overall services of e-government. Questions were developed mainly by using 5-point Likert-type scale (1 for strongly disagree to 5 for strongly agree) for each of the questions. The purposes and the importance of the study, as well as a definition of e-government were also provided to facilitate participation in the survey, in which all of the respondents voluntarily participated.

Measurement scales: The instrument was developed from a review of the literature and measured constructs consisting of 38 items: (1) Information quality, (2) System quality, (3) Service quality, (4) Facilitating conditions, (5) Social Influence, (6) Self-efficacy, (7) Personal innovativeness in IT (8) Perceived usefulness, (9) Perceived ease of use and (10) Intention to use, as shown in Table 2. All of the constructs included in the

Table 2: Definition of all constructs

Construct	Operation definition	Source
System quality	The quality which user's perception on performance of information system itself	Lee <i>et al.</i> (2009)
Information quality	An individual's perception on the information that the system produces	Lee <i>et al.</i> (2009)
Service quality	Users' perception on the performance of service provider	Lee <i>et al.</i> (2009)
Self-efficacy	Users' belief his/her own capacity to affect a specific behavior	Bandura (1982)
Facilitating conditions	Facilitating conditions or resources are the factors that help people easy to perform and accomplish their tasks	Thatcher <i>et al.</i> (2007)
Social Influence	An individual's perception that people who are important think he or she should perform the behaviour	Fishbein and Ajzen (1975)
Personal innovativeness in IT	The willingness of an individual to try out any new information technology (IT)	Agarwal and Prasad (1998) and Thatcher and Perrew (2002)
Perceived usefulness	Users' perception e-government easy to use when using it.	Davis (1989)
Perceived ease of use	Users' perception when they using e-government service it improve efficiency of their work	Davis (1989)
Intention to use e-government	An individual's behavioral intention to use e-government	Moon and Kim (2001)

questionnaire were adapted from previous studies to ensure their reliability and validity. The two constructs of importance from TAM, which include Perceived Usefulness (PU) and Perceived Ease of Use (PEOU), were adapted from the measurement as defined by Davis (1989), while behavioral intention to use (IN) was adapted from Moon and Kim (2001). System Quality (SQ) was measured by Doll and Tokzadeh (1988), DeLone and McLean (1992) and Aladwani and Palvia (2002). System quality was measured in terms of five composite items: ease of navigation, availability, response time, security and ease of access. Information Quality (IQ) was measured by DeLone and McLean (1992), Aladwani and Palvia (2002) and Liao *et al.* (2006). Information quality was measured in terms of four composite items: content, accuracy, timeliness and information reliability. The Service Quality (SVQ); construct was adapted from previous studies as defined by Parasuraman *et al.* (2005), Akinci *et al.* (2010), Aladwani and Palvia (2002) and Barnes and Vidgen (2006). Service quality was measured in terms of four composite items: responsiveness, contact, empathy and assurance. Self-efficacy (SE); adapted from Taylor and Todd (1995). Facilitating Conditions (FC); adapted from Taylor and Todd (1995), Mathieson *et al.* (2001), Hung *et al.* (2006) and Gu *et al.* (2009). Social Influence (SI); adapted from Taylor and Todd (1995), Hung *et al.* (2006) and Gu *et al.* (2009). Personal innovativeness in IT (PIIT); adapted from Agarwal and Prasad (1998) and Thatcher *et al.* (2007).

Reliability and validity of the scale: A questionnaire was used, which was initially drafted based on the literature review. We conducted a pre-survey including 30 e-government service users. To assess reliability and the internal consistency of all constructs, Cronbach's alpha was used to check all of the items. The questionnaire constructs were then revised based on responses from the pre-survey. As shown in Table 3, the reliability of facilitating conditions was the lowest, at 0.721. Nunnally (1978) suggested that the reliability analysis obtaining

Table 3: Result of reliability and convergent validity testing

Construct	Mean	Standard deviation	Factor loadings	Cronbach's alpha
System quality				0.919
SQ1	3.42	0.949	0.788	
SQ2	3.51	1.006	0.739	
SQ3	3.09	0.902	0.788	
SQ4	3.24	0.895	0.661	
SQ5	3.29	0.950	0.810	
Information quality				0.927
IQ1	3.21	0.940	0.732	
IQ2	3.52	0.791	0.830	
IQ3	3.07	0.943	0.794	
IQ4	3.65	0.842	0.819	
Service quality				0.903
SVQ1	2.93	0.930	0.738	
SVQ2	3.39	0.964	0.800	
SVQ3	3.52	0.939	0.832	
SVQ4	3.24	0.908	0.821	
Facilitating conditions				0.721
FC1	3.69	0.986	0.846	
FC2	3.61	0.941	0.871	
FC3	3.51	1.060	0.754	
FC4	3.58	0.914	0.728	
Self-efficacy				0.871
SE1	3.60	0.887	0.854	
SE2	3.68	0.854	0.911	
SE3	3.59	0.932	0.852	
Social influence				0.815
SI1	3.20	0.915	0.777	
SI2	2.94	0.999	0.813	
SI3	3.35	0.938	0.769	
SI4	2.96	0.998	0.780	
Personal innovativeness in IT				0.794
PIIT1	3.72	0.976	0.850	
PIIT2	3.19	1.004	0.844	
PIIT3	3.60	0.958	0.843	
Perceived ease of use				0.948
PEOU1	3.55	0.851	0.854	
PEOU2	3.47	0.825	0.897	
PEOU3	3.47	0.858	0.867	
PEOU4	3.42	0.854	0.885	
Perceived usefulness				0.963
PU1	3.48	0.898	0.903	
PU2	3.52	0.915	0.901	
PU3	3.51	0.861	0.891	
PU4	3.69	0.895	0.817	
Intentions to use				0.955
IN1	3.80	0.881	0.915	
IN2	3.60	0.914	0.939	
IN3	3.59	0.905	0.917	

Cronbach's alpha values of all constructs exceeding the value of 0.7 was classified as having adequate reliability.

Factor analysis was performed to confirm the validity of each construct, as shown in Table 2. Construct validity was examined by principal factor analysis using the varimax rotation. Factor loading of every construct exceeding the value of 0.5 is acceptable (Hair *et al.*, 1995). As shown in Table 3. 16 factor loading of all items in this study obviously exceeded 0.5, since it ranged from 0.661 to 0.939. All measurements used in this study have been listed in Appendix A.

DATA ANALYSIS

The data were analyzed using the Structural Equation Modeling (SEM) technique by LISREL 8.8 software, to test the significance of the paths within the research model and the proposed hypotheses in this study. In all tests of structural equation modeling, the R-square value explained the amount of variance on independent variables and the path coefficients beta weight (β) was predictive of the strength of the relationships between the constructs.

Profile of the respondents: Descriptive statistics of the respondents are shown in Table 4, with a total sample size of 400 respondents. Of the respondents, 55% were female and 45% were male. From the personal information gathered, it was found that the majority of respondents were between 21-30 years old (58%); had an education level of associates or bachelor's degree (73.8%); worked in government sector (45.2%) and were experienced in using internet for over 5 years (70.2%). For activities related to the internet, it was revealed that most of respondents surf the internet over 7 h per week (47%); accessed the internet at their school/university/workplace (69.5%) and were experienced using www.ecitizen.gov.sg (26%). Respondents utilized the e-government service one time every day at least 30%. A large group of respondents (69.8%) used e-government for search/download forms.

Test of model fit: The model was tested for model fit by using several fit indices: relative chi-square, Goodness of Fit (GFI), Adjusted Goodness of Fit (AGFI), Normalized Fit Index (NFI), Comparative Fit Index (CFI), Root Mean Square Residual (RMR) and Root Mean Square Error of Approximation (RMSEA). The overall index values were assessed to a measurement model for a good model fit. The results indicate a ratio of chi-square to degrees of freedom at 1.24, GFI at 1.00, AGFI at 0.97, NFI at 1.00, CFI

at 1.00, RMR at 0.00 and RMSEA at 0.03 all values were at an acceptable level and indicate a good model fit (Table 5).

Table 4: Profile of respondents

Measure	Item	Responses	
		No.	%
Gender	Male	180	45.0
	Female	220	55.0
Age	Under 20 years old	15	3.8
	21-30 years old	232	58.0
	31-40 years old	95	23.8
	41-50 years old	46	11.5
Education	Over 50	12	3.0
	High school or below	46	11.5
	Associate's or Bachelor's degree	295	73.8
	Master's degree or higher	59	14.8
Occupation	Self employment or proprietor	11	2.8
	Government officials or government enterprises officials	181	45.2
	Students	68	17.0
	Private sector employees	76	19.0
	Unemployment/Retire	8	2.0
	Others	56	14.0
Years of internet experiences	Below 1 year	14	3.5
	1-3 years	36	9.0
	3-5 years	69	17.3
	Over 5 years	281	70.3
Average weekly hours spent on surfing the internet	Below 1 h	23	5.8
	1-3 h	59	14.8
	3-5 h	78	19.5
	5-7 h	52	13.0
	Over 7 h	188	47.0
Internet access location	At school/at university/at work	278	69.5
	At home	110	27.5
	In Internet cafe'	12	3.0
e-government website ever used (multiple choices)	www.rd.go.th	108	24.0
	www.dlte-serv.in.th	8	2.0
	www.ecitizen.go.th	116	26.0
	www.khonthai.com	59	13.0
	www.doe.go.th	64	14.0
	www.totservice.com	10	2.0
Frequencies using e-government service	Other	82	19.0
	One time every day at least	120	30.0
	One time every week at least	108	27.0
	One time every month at least	108	27.0
Purpose of e-government use	One time every year at least	64	16.0
	Search/download forms	279	69.8
	Performing transactions	45	11.2
	Both	76	19.0

*Respondents' profile (N = 400)

Table 5: Fit indices for measurement

Goodness-of-fit measure	Recommended value*	Model value
Fit measures		
$\chi^2/\text{degree of freedom}$	≤ 3.00	1.24
Goodness-of-fit (GFI)	≥ 0.90	1.00
Adjusted goodness-of-fit (AGFI)	≥ 0.80	0.97
Normalized fit index (NFI)	≥ 0.90	1.00
Non-normalized fit index (NNFI)	≥ 0.90	1.00
Comparative fit index (CFI)	≥ 0.90	1.00
Root mean square residual (RMR)	≤ 0.05	0.00
Root mean square error of approximation (RMSEA)	≥ 0.10	0.03

Fit indices for measurement, *Recommended values have been adapted by Hair *et al.* (1995)

Hypotheses testing: A preliminary test to check for a multicollinearity problem of data was analyzed by employing the correlations. This analysis found that all constructs had a correlation value below 0.8 and were supported at the 0.01 level. Therefore, no significant multicollinearity problem was found in our variables as shown in Table 6.

According to Fig. 2, users' perception of system quality, information quality, service quality, social influence and perceived ease of use positively affected perceived usefulness with regards to the intention of citizens to accept e-government service, respectively. The five factors that can explain 59% of the total variance in perceived usefulness are: System quality ($\beta = 0.13$, $p < 0.05$), information quality ($\beta = 0.12$, $p < 0.05$), service quality ($\beta = 0.18$, $p < 0.01$), social influence ($\beta = 0.15$, $p < 0.001$) and perceived ease of use ($\beta = 0.42$, $p < 0.001$);

these were found to significantly and positively affect perceived usefulness. The study shows that perceived ease of use was the strongest influence on perceived usefulness of e-government service. Therefore, hypotheses H1, H3, H5, H9 and H13 were supported, respectively.

Hypotheses H2, H4, H6, H7, H8 and H10 examining the effects of users' perception of system quality, information quality, service quality, self-efficacy, facilitating conditions and personal innovativeness in IT were shown to significantly positively affect perceived ease of use of e-government service. This result found that an R-square value shows that this analysis explained 69% of the variance in perceived ease of use of e-government service. The independent variables included self-efficacy ($\beta = 0.58$, $p < 0.001$), which had the strongest impact on perceived ease of use; followed by

Table 6: Correlations among constructs

Variables	1	2	3	4	5	6	7	8	9	10
SQ	1.000									
IQ	0.654**	1.000								
SVQ	0.651**	0.695**	1.000							
FC	0.238**	0.282**	0.349**	1.000						
SE	0.449**	0.480**	0.534**	0.573**	1.000					
SI	0.474**	0.448**	0.559**	0.308**	0.465**	1.000				
PIIT	0.317**	0.356**	0.404**	0.393**	0.520**	0.381**	1.000			
PEOU	0.540**	0.502**	0.587**	0.367**	0.643**	0.486**	0.557**	1.000		
PU	0.584**	0.570**	0.636**	0.368**	0.607**	0.531**	0.399**	0.686**	1.000	
IN	0.471**	0.447**	0.500**	0.359**	0.599**	0.502**	0.404**	0.577**	0.638**	1.000

**Correlation is significant at the 0.01 level (2-tailed), Correlations among constructs

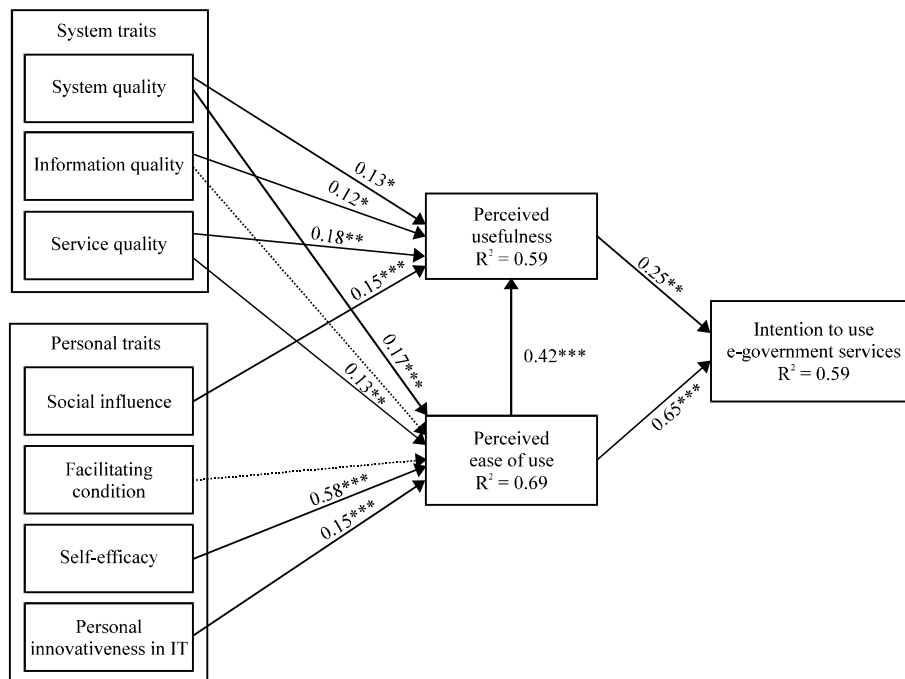


Fig. 2: Results of research model, *0.05 significance level, **0.01 significance level, ***0.001 significance level

personal innovativeness in IT ($\beta = 0.15$, $p < 0.001$); system quality ($\beta = 0.17$, $p < 0.001$) and service quality ($\beta = 0.13$, $p < 0.01$). As a result, hypotheses H4, H6, H8 and H10 were supported. Other determinants did not have significant effects on perceived ease of use.

Both Perceived usefulness (H11) and perceived ease of use (H12) positively affected citizens' intention to use e-government service, respectively. Therefore, hypotheses H11 and H12 were supported. Perceived usefulness and perceived ease of use can explain 59% of the variance in citizens' intention. From the results, it was also found that the impact of perceived ease of use was a much stronger predictor of intention to use with $\beta = 0.65$. From these results 11 hypotheses were retained and 2 hypotheses were rejected. The results for the research model are shown in Fig. 1.

DISCUSSION

Discussion of research finding: This study explained factors influencing citizens' acceptance of e-government service context in Thailand. The results showed that personality traits (self-efficacy, social influence and personal innovativeness in IT) and system traits (system quality, information quality and service quality) lead to citizens' acceptance and use of e-government service. For e-government service, it was found that not only are ease of use and usefulness important; but other factors also influence the willingness of citizens to use it, such as personality traits and system traits of the information system. The extended Technology Acceptance Model (TAM) tested the impact of this concept for analyzing citizens' perception toward e-government service intention from a G2C context.

The research reveals that system quality significantly affected perceived ease of use and perceived usefulness (H1 and H2). These results are consistent with the findings of Ahn *et al.* (2007). When citizens perceive a system to be of high quality when using e-government service, they should sense that it is useful and simple which will lead to use of the service. Thus, system quality should be improved by government IT staff to enhance the perception of usefulness and ease of use. Online e-government service should also provide ease of navigation, availability, response time, security and ease of access. If citizens find an e-government service difficult to navigate or delays in interaction, they will not visit the website again. Our results have implications for governments in considering on the operation of e-government service to increase perceived system quality from citizens.

Information quality significantly affected perceived usefulness H3, as information quality of a website can enhance citizens' perception of perceived usefulness in e-government service context. This result is consistent with the findings of Ahn *et al.* (2007). Government websites should concentrate on development of high information quality. If websites are not capable of providing good content that has accurate, updated and reliable information; it is likely that citizens will not consider using the websites. Thus, the government should improve the information quality of their websites to achieve citizen satisfaction. However, it is surprising that the information quality of a website is not important to citizens' perceived ease of use H4. Perceiving higher information quality does not lead to less complication in using e-government. In sum, information quality has a significant effect on citizens' intention to accept e-government due to its perceived usefulness, not its perceived ease of use in this field.

The influence of service quality on perceived usefulness and perceived ease of use to the acceptance of e-government service by citizens is significant (H5 and H6). These results are consistent with the findings of other studies (Ahn *et al.*, 2007). The citizens who receive greater service quality are more likely to think that e-government is useful and less difficult to use. It appeared that when citizens use e-government websites, they want to feel care from government service. This study suggests that if e-government websites need to improve service quality, the government should offer a high level of service by providing responsiveness, empathy, assurance and ways to contact government when citizens have a problem.

Social influence affected the usefulness of e-government service H9. This is again consistent with the results of previous studies (Taylor and Todd, 1995). This suggested that as social influence increases this leads to increased intention to use and accept e-government service. This implies that citizens would find e-government service more useful when they receive more influence to believe so from their peers, parents or friends. Thus, social pressure was important in influencing citizens' decision to use government online service.

Facilitating conditions were in significant in affecting perceived ease of use H8. Again, this is consistent with the results of previous studies (Gilbert *et al.*, 2004; Taylor and Todd, 1995). It can be seen that support provided by resources such as personal computers, internet service for citizens, knowledge have a direct impact on how citizens feel about using e-government

service and prevent them from feeling barriers to use of the service. Our respondents rated at a 3.60 mean value, probably because they are internet users so they have many resources to support the use of e-government. Thus, facilitating conditions were not shown to lead to citizens' acceptance of e-government in this study.

This study reveals that self-efficacy has a positive influence on perceived ease of use H7 and was found to have the most significance as compared to the other factors. This result is consistent with the results of previous studies (Gu *et al.*, 2009; Hernandez *et al.*, 2009; Venkatesh, 2000). Thus, self-efficacy was a key factor for predicting citizens' intention toward e-government acceptance. This implies that self-efficacy made citizens feel as though they did not have to expend effort throughout the use of e-government service. Therefore, self-efficacy considerably improved the perception of simplicity of e-government service.

Personal innovativeness in IT significantly affected perceived ease of use H10. This result is consistent with the results of previous studies (Kuo and Yen, 2009; Lu *et al.*, 2005). This implies that the more that there is personal innovativeness in IT of citizens, the easier they find the use of e-government service. Citizens who have a higher level of personal innovativeness consider the use of e-government service to be easier. It was suggested that government should support the necessary technical infrastructure to overcome barriers of access and should facilitate the intention to accept the use of e-government service.

As for intention, both ease of use and usefulness were found to have a direct effect on intention to accept e-government service H11 and H12. Again, this is consistent with the results of many TAM studies (Jung *et al.*, 2009; Lu *et al.*, 2009; Moon and Kim, 2001; Taylor and Todd, 1995). The finding reveals that perceived ease of use is the most important factor which influences citizens' behavioral intention toward e-government service. This result is consistent with the findings of Kwon and Wen (2010). Moreover, perceived usefulness has a positive effect on perceived ease of use of e-government service H13. This is again consistent with the results of other studies (Davis, 1989; Lee *et al.*, 2009; Lu *et al.*, 2009; Moon and Kim, 2001; Taylor and Todd, 1995). From this result, it can be implied that perceived usefulness had an encouraging effect on citizens' intention, because of the belief that e-government service was easy to use. Citizens perceive e-government service to be useful because the services were easily used.

The findings showed that perceived usefulness was significantly affected by system quality, information

quality, service quality, perceived ease of use and social influence. The higher the level of perceived usefulness, the higher the level of intention to use e-government service will be. The results indicate that perceived ease of use is the most important factor in predicting perceived usefulness. Again, this is consistent with the results of previous studies (Davis, 1989; Moon and Kim, 2001; Taylor and Todd, 1995). Government agencies should pay attention to how e-government service can be provided with less difficulty. E-government websites should provide an easy way for citizens to find information and services they need.

Personal innovativeness in IT, self-efficacy, service quality and system quality all have an influence on perceived ease of use, which serves to predict intention to use e-government service. Self-efficacy was the most important factor driving citizen's perceived ease of use of e-government services. The level of confidence a citizens feels in using e-government service was an important factor in determining a citizens' intention. Thai government should increase self-efficacy with e-government service usage. E-government websites should provide citizens with systems that are less difficult by increasing their ease of use. Individuals have differences in their own personality (e.g., self-efficacy) and these personality traits are important factors which the government needs to consider to offer appropriate features that help users conduct their work on the website. To increase the level of citizen's intention, citizens need to feel more confident when using e-government services.

Limitations: This study has some limitations in its scope. First, the data gathered were focused on a specific group of citizens in Bangkok, from which it was not difficult to collect a sample; thus, they were not representative of the whole population which is a limitation to the generalize of the findings. The sample size in future studies could include citizens from other areas in the country. Second, this study was limited in that respondents were only experienced users of e-government service. Third, there are a number of different types of e-government services; thus, the results might not apply for all services. Fourth, only a limited number of factors were focused on in this study. Further, a number of new factors must be considered as determinants of e-government service to effectively investigate users' intention such as web experience, perceived value of information system, computer anxiety, culture and awareness of service.

APPENDIX

Appendix A: Questionnaire items

System quality (SQ)

- SQ1 E-government services provides with navigation to find information what I need.
- SQ2 E-government services are always up and available when I want to use.
- SQ3 When I access e-government services, the response of website is fast.
- SQ4 E-government services look secured for carry out transaction.
- SQ5 E-government services provide ease of access the site

Information quality (IQ)

- IQ1 E-government services provide sufficient content where I want to find information
- IQ2 The information of e-government services is accurate.
- IQ3 E-government services provide up to date information.
- IQ4 E-government services provide reliable information as I need.

Service quality (SVQ)

- SVQ1 When I have problems, E-government services take care of problems promptly.
- SVQ2 E-government services tell me what to do if my transaction have problem.
- SVQ3 E-government services provide a telephone number to reach the government agencies.
- SVQ4 E-government services have customer service representatives available online (e.g., e-mail, web board).

Facilitating conditions (FC)

- FC1 Resources required to use e-government services were available to me.
- FC2 I had access to the hardware and software and services needed to use e-government service.
- FC3 Financial resource (e.g., to pay for hardware, software and internet services) is not a barrier for me in using e-government service.
- FC4 I have the knowledge necessary to use e-government services.

Self-efficacy (SEL)

- SE1 I would feel comfortable using e-government services on my own.
- SE2 If I wanted to, I could easily operate any of the equipment to use e-government services on my own.
- SE3 I would be able to use the e-government services even if there was no one around to show me how to use it.

Social influence (SC)

- SI1 My peers/colleagues/friends thing that I should use e-government services.
- SI2 People I knew influence me to try out e-government service.
- SI3 I use e-government services because it is very famous.
- SI4 I use e-government services because many people use it.

Personal innovativeness in IT (PIIT)

- PIIT1 If I heard about a new information technology I would look for ways to experiment with it.
- PIIT2 Among my peers I am usually the first to try out new information technologies.
- PIIT3 I like to experiment with new information technologies.

Perceived ease of use (PEOU)

- PEOU1 Learning to use e-government services is easy for me.
- PEOU2 My interaction with e-government services is clear and understandable.
- PEOU3 I find it easy to get e-government services to do what I want to do.
- PEOU4 It is easy for me to become skilful at using e-government services.

Perceived usefulness

- PU1 Using e-government services would enhance me to accomplish task more quickly.
- PU2 Using e-government services make it easier to do my tasks.
- PU3 Using e-government services enhance the efficiency of my task.
- PU4 I find e-government services useful in my task.

Behavioral intentions to use (IN)

- IN1 I will use e-government services in the future.
- IN2 I will frequently use e-government services in the future.
- IN3 I will recommend others to use e-government services.

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