AN ASSESSMENT MODEL FOR E-GOVERNMENT SERVICE DELIVERY IN A THAI CONTEXT

By

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DECLARATION

I declare that this submission is my own work. It contains neither material previously published or written by another person, nor any material previously submitted for an award of any other degree or diploma at DPU or any other educational institution, except where due acknowledgement has been made in the thesis. Also I declare that the intellectual content of this thesis is the result of my own work, except where attributed and acknowledged in this thesis.

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Sayamol Nongbunnak

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ABSTRACT

The study aims to identify an evaluation framework and a measurement tool for e-government service delivery. Government services are offered through websites of government agencies for citizens. Electronic government (e-government) and electronic participation (e-participation) initiatives are presented on the same government websites to render government services and facilitate public participation. However, the evaluations are performed separately. The current evaluation tools are produced by service providers and centered in technology advancement and global comparison among members. The local context is lesser concern. The comparison is a snapshot of the evaluation. Decisions for improvements and adjustment of strategic directions depend on each country. The evaluation of Thai government websites can assist the government to provide better quality services and fulfill the needs and requirements of Thai citizens.

A scale development for information system research is applied to identify a measurement tool for e-government service delivery focus in a Thai setting. The design of scale development comprises a qualitative method and a quantitative

method. The DeLone and McLean Information System Success Model 2003 was selected as an initiative model. The model comprised six constructs; Information Quality, System Quality, Service Quality, Use, User Satisfaction, and Net Benefits. Participation Quality measure was added to capture the public participation in e-government service delivery. The instrument was tested and validated in quantitative method. Users of e-government services were invited to answer the questionnaire via electronic mail.

The results showed that e-government service delivery can be systematically evaluated in terms of the preparation of the system, the use of the system, and the consequences of using the system. Participation Quality can be included to measure the success of e-government service delivery with other quality elements; Information, System and Service. Use and User satisfaction measures are applied to described the consumption step and Net Benefits to determine the consequence of using the system. System Quality and Participation Quality influence the Use and the level of Satisfaction compare with Information Quality and Service Quality. The measurement tool contributes to a better understanding of the evaluation of e-government service delivery in a Thai setting. The study also presents theoretical and practical contributions.

CHAPTER 1

INTRODUCTION

1.1 Background to the Research

Evaluations of government websites are a crucial part of electronic government service delivery (e-government service delivery). Citizens can input their feedback for governments to adjust to provide better service quality. The government has offered information and services through websites as an additional channel of service delivery. Barriers of location and time are eliminated with the application of information and communication technology (ICT). Information and services are available 24/7 (twenty-four hours per day and seven days per week), and citizens are able to access government services at anytime from anywhere. Consequently, the demands and priorities of citizens have changed. The government has to cope with changing requirements by improving its information and services to the public (Aksararak & Pornwasin, 2004; United Nations, 2008, 2010, 2012).

Government officials and their agencies have the obligation to provide government services equally to all citizens. The roles of government officials and services offers are tied to laws, rules, and regulations (Goldkuhl, 2008). The Thai government has established the electronic government (e-government) initiative to modernize the administrative processes and provide better services to residents (Aksararak & Pornwasin, 2004; National Electronics and Computer Technology Center, 2009; Office of the Public Sector Development Commission, 2003).

Traditionally, citizens had to visit government offices during office hours to request and obtain information and services. When information and communication

technology (ICT) is adopted, the government offers information and services through websites as an additional channel of service delivery (United Nations, 2008, 2010).

The electronic government (e-government) initiative was initiated to take care of ICT related matters including the planning, implementation, monitoring, and improvement of government service delivery. Benefits for Thais are an increase in the efficiency of the administration of government agencies, reduced cost and increased national competitiveness (Aksararak & Pornwasin, 2004; National Information Technology Committee Secretariat, 2003).

Government is under pressure to evaluate the development of e-government initiatives and the participation of citizens through government websites as stated in the Royal Decree for Criteria and Procedure for Good Governance 2003 (Office of the Public Sector Development Commission, 2003). Assessment is an important part that can provide feedback for effective management and the continuous improvement of the quality and productivity of an organization. Systematic measurements are required to guide management. Evaluations of government websites allow governments to monitor and assess government service delivery (Ministry of Information and Communication Technology, 2011; Myers, Kappelman, & Prybutok, 1997; National Electronics and Computer Technology Center, 2009; United Nations, 2012).

1.2 Research Problem

The evaluation of websites can assist both e-government and e-participation initiatives to provide better quality services and fulfill the needs and requirements of citizens. ICT is employed to enhance the efficiency of public

administration and government service delivery (Office of the Public Sector Development Commission, 2003; United Nations, 2008, 2012). E-government and e-participation initiatives are offered to the public through websites of government agencies. Citizens are able to access government services and contribute to public administration via the same website. However, the measurement of both initiatives is performed separately.

E-government is a global agenda. Many international organizations have studied and defined it in their own way such, as the European Commission, the Organization for Economic Co-operation and Development (OECD), and the United Nations, For example, OECD refers to e-government as "the use of ICT, and particularly the Internet, as a tool to achieve better government" (The Organisation for Economic Co-operation and Development, 2003). For Thailand, the Information Technology Policy Framework 2001-2010 (IT 2010) refers to e-government as the application of electronic means in public administration and services with the goal of building a Knowledge-Based Society, creating good governance and enhancing competitiveness, leading to a higher quality of life for Thai society (National Information Technology Committee Secretariat, 2003). The ICT 2020 continues to employ ICT to improve government service delivery and public participation (Ministry of Information and Communication Technology, 2011).

The definition of e-government focuses on the use of ICT, including the Internet and World Wide Web technology to enhance public administration and to achieve better government, to increase competitiveness and to strengthen the relationship with citizens (Ministry of Information and Communication Technology,

2011; National Electronics and Computer Technology Center, 2009; Organisation for Economic Co-operation and Development, 2003; United Nations, 2010, 2012).

The electronic participation (e-participation) initiative has been established to increase the ability of citizens to participate in the political processes and to transform to digital government information and services (Macintosh & Whyte, 2008; Sæbø, Rose, & Flak, 2008). ICT is utilized as a tool to increase public participation. Citizens are able to be involved by inputting their feedback on government projects and perform their duties through websites (United Nations, 2010, 2012). The focal point remains the 'citizens', similar to e-government initiatives.

The improvement of government service delivery and the rise in urban populations have driven governments to cope with intensifying demand in cities and local communities. The evaluation of e-government initiatives has shifted from a global level to regional (Williams, 2008) and national levels (Previtali & Bof, 2009; Sang, Lee, & Lee, 2009; Sarabdeen & Rodrigues, 2010; Wangpipatwong, Chutimaskul, & Papasratorn, 2008). More and more research studies have concentrated on the national level such as Cambodia (Sang, et al., 2009), Iran (Zokaee, Ebrahimi, & Ghazizadeh, 2012), Malaysia (Hussein, Karim, & Selamet, 2007; Siddiquee, 2008), Mauritius (Shalini, 2009), Philippines (Siar, 2005), and Portugal (Fedotova, Teixeira, & Alvelos, 2012). Citizens' feedback plays an essential role in the evaluation. The focus is on the needs and priorities of citizens (Evans & Yen, 2006; United Nations, 2012), as it does in a Thai context, where citizens' requirements are vital. Their feedback can help shape government services and public administration to fulfill citizens' needs and government obligations.

Evaluation methods for traditional services, such as the Baldridge's criteria (Malcom Baldridge National Quality), the Balance Scorecard and ISO (International Organization for Standardization) are rarely applied to e-government services (Halaris, Magoutas, Papadomichelaki, & Mentzas, 2007). A number of new tools have been produced to measure e-government development, such as the Citizen Satisfaction Model (CSM) (H. Lee et al., 2008), Website Quality (Barnes & Vidgen, 2008; Miranda, Sanguino, & Bañegil, 2009; Panopoulou, Tambouris, & Tarabanis, 2008), and the Stage Model (Ancarani, 2005; Belanger & Hiller, 2006; Guo & Lu, 2008; Layne & Lee, 2001; Shackleton, 2006; United Nations, 2003, 2004, 2005, 2008, 2010, 2012; Wauters, 2006; West, 2004).

The evaluation of e-Participation, on the other hand, is assessed separately from e-government initiatives. For example, the United Nations (UN) has included an E-Participation Index as part of the UN E-government Survey since 2003 to measure the willingness of governments to facilitate citizen participation in political processes (United Nations, 2003, 2008, 2010, 2012). Other e-participation research studies have determined evaluation frameworks (Funikul, Quirchmayr, Chutimaskul, & Traunmüller, 2006; Macintosh, 2004; Macintosh & Whyte, 2008) including the actors involved in the participation processes, the effects of e-participation (Sæbø, et al., 2008), and the measurement effectiveness of tools that facilitate online participation (Grönlund, 2003; Kamal, 2009; Zissis, Lekkas, & Papadopoulou, 2009).

The current tools focus on technological advancement, service provider perspectives, and global comparison (M. M. Brown, 2007; H. Lee, et al., 2008; Marchand & Raymond, 2008; Miranda, et al., 2009; Rocheleau, 2000; Rorissa, Demissie, & Pardo, 2011; United Nations, 2008; Weinstein, 2009). For example, the

UN E-government Survey is a snapshot of e-government evaluation. Decisions for improvements and adjustment of strategic directions depend on each member country (United Nations, 2010, 2012).

In a Thai perspective, an online questionnaire is utilized to seek feedback about the level of satisfaction of users in accordance with the Royal Decree on Criteria and Procedures for Good Governance and ICT Master Plans. The results are used for the improvement of government agencies (National Electronics and Computer Technology Center, 2003, 2009; Office of the Public Sector Development Commission, 2003).

The study of e-government in Thailand began in 2005 with Sivaporn Wangpipatwong, Wichian Chutimaskul, and Borworn Papasratorn who studied factors influencing the adoption of e-government websites. Later in 2008, information system success was applied to investigate the level of user satisfaction in the continuation of using the websites including the quality of information and the system (Wangpipatwong, et al., 2008). Others have focused on risk in e-government services (Rotchanakitumnuai, 2008) and trust in the e-government system of the Excise Tax Department (Khayun, Ractham, & Firpo, 2012). The study of e-participation is more recent. The foci are on e-democracy development and e-parliament (Funikul, et al., 2006; Kanthawongs & Lee).

Even though the research trend has moved to reflect the local perspective, more researches in a Thai context are necessitated. Nevertheless, the review leaves a question as to what is a measurement tool for e-government service delivery that covers information provision, government services and citizen participation in a Thai context.

1.3 Research Question

What is the assessment model for e-government service delivery in a Thai context that accommodates users' needs?

1.4 Research Objectives

The aims of this research study are as follows:

1.4.1 To identify an evaluation framework for e-government websites.

1.4.2 To develop a measurement instrument in a Thai context.

1.5 Significance of the Research

Since e-government service delivery is a global agenda, a number of evaluation tools have emerged from international organizations, such as the United Nations in order to compare the progress and development among countries. Evaluation frameworks are initiated by service providers or suppliers of government services. Consequently, the attention is centered on their requirements and objectives (Marchand & Raymond, 2008; Miranda, et al., 2009; Rorissa, et al., 2011; Weinstein, 2009). However, the improvement and development of government services have to be carried out by the country (Rorissa, et al., 2011; United Nations, 2010, 2012). Local evaluation and understanding are the keys to the improvement and development of e-government service delivery in Thailand.

Undoubtedly, each country has different objectives in providing services to its citizens. Yet those objectives cannot be directed only to fulfill the ranking of the country in global comparisons. Government, including the Thai government, has an obligation to evaluate its performance in order to identify citizens' needs, to provide

room for improvement and to develop government services (Goldkuhl, 2008; National Electronics and Computer Technology Center, 2009; United Nations, 2012).

Hence, a government cannot simply adopt and apply rules and tools from the private sector with its citizens. Citizens are different from customers. Citizens are unable to choose service providers. Government cannot categorize citizens in the same way the private sector does with its customers. A government depends on citizens and vice versa. They cannot be separated (Stahl, 2005). The needs of government services for Thais are in a Thai setting and environment.

The study of e-government evaluation in Thailand has increased (Funikul, et al., 2006; Wangpipatwong, Chutimaskul, & Papasratorn, 2005; Wangpipatwong, et al., 2008). However, few research frameworks have addressed e-government services (Funikul, et al., 2006) and user satisfaction of e-government websites (Wangpipatwong, et al., 2008). Other frameworks have been on citizen adoption (Wangpipatwong, et al., 2005), risk management (Rotchanakitumnuai, 2008), evaluation frameworks (Funikul, et al., 2006), and e-parliament (Kanthawongs, 2005). Hence, evaluating e-government service delivery has to cover most of the aspects of government services, including the participation of citizens.

To evaluate both government services and the participation of citizens, an assessment instrument has to be identified. A systematically selected framework is involved in the development process. E-government service delivery has information system (IS) characteristics. First, it has to be created for citizens. Citizens then use government services from websites of government agencies and then obtain benefits from using E-government service delivery. This process makes it possible to measure the preparation system, the use system, and the consequences of the usage together.

Variables and measures that focus on Thai e-government service delivery have to be identified. A draft instrument has to be tested and applied within the e-government environment.

1.6 Research Method

The study applies scale development to investigate a framework and a measurement instrument for e-government service delivery. The scope of e-government service delivery includes government services and citizen participation (see Section 1.7). The design of scale development comprises a qualitative method and a quantitative method. The exploration of a qualitative method is required in order to search for a framework and draft an instrument to be tested in the quantitative method (Creswell & Clark, 2007; DeVillis, 2003).

Examinations of current websites are performed prior to the instrument development procedure. The aim is to search for an existing online survey and other evaluation tools presented on Thai government websites. Websites at ministerial and departmental levels are randomly chosen and the presence of evaluation tools is investigated. Questions in the existing survey are explored as to whether the requirements in the Royal Decree on Criteria and Procedures for Good Governance (2003) are included: the information of respondents, the quality of services, the level of satisfaction and the impact of value for money (Office of the Public Sector Development Commission, 2003).

The Construct Development Methodology is a scale development procedure for the IS research field. It is applied to search for a framework and craft a measurement tool. The method consists of three stages: Domain, Instrument, and

Measurement Properties. A measurement framework is identified in the first stage using content analysis. Various techniques are utilized such as literature review, online database, government documents and other related journals. A framework is selected together with a list of dimensions, item stems and item statements. A draft instrument is obtained with a set of questionnaires. The second stage involves a pre-test, a pilot test of the survey and the screening of item stems. The questionnaire is applied with pre-specified samples to test its reliability and validity. Data are collected and analyzed using Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). The final result is a validated measurement instrument for e-government service delivery in a Thai context (Lewis, Templeton, & Byrd, 2005).

1.7 Definition of Terms and Limitations

The definition of e-government services in this study is sought and the focus is on the use of ICT as a strategic tool.

E-government service delivery refers to "*the use of ICT and electronic means in public administration for the provision of information and services to the people, and increase citizen's abilities to participate in the political processes*".

"Government websites" cover websites of Thai government agencies at ministerial and departmental level, local authorities, and other organizations under the supervision of the Ministry. A list of government websites can be found at the Thai government directory (http://www.thaigov.net/links.php), the Office of Thai Prime Minister (http://www.opm.go.th/opminter/mainframe.asp), or Wikipedia at http://en.wikipedia.org/wiki/List_of_Government_Ministers_of_Thailand.

There are some limitations as follows:

a) Users are actual users and potential users who interact with government via websites. Non-users, who acquire services through other channels, such as face-to-face or telephone calls, are not included. Users are asked to voluntarily answer the online survey. If they are not comfortable filling in the survey, they will not be forced to do so.

b) The level of IT literacy: Users are assumed to have the ability to access government websites. Users are supposed to search for information, download forms and documents, and input their ideas on any discussion forum. If online transactions are available, users should be able to pay for products and services.

c) Location and internet connection: Users can access government services from anywhere the internet service is available, for instance, work places, home, or internet cafés. There is no limitation of time and places to log on to government websites.

d) Usage of applications and devices: This study focuses on the exploration of e-government service delivery on a standard personal computer. Using other devices such as tablets and mobile phones to connect with the government is not included. The dynamic expansion and development of ICT has led online applications and devices to become much smaller and more powerful. The usage and the development of technologies are not included as factors in this study.

1.8 Contributions

The study model offers theoretical and practical means to evaluate the success of complex systems like e-government service delivery. The contributions of this research are in theoretical and practitioners' parts.

Theoretical contribution

a) The study allows researchers to better understand the measurement of e-government service delivery.

Theories and evaluation frameworks play important roles in developing a measurement instrument (Lewis, et al., 2005; Peter, 1981). Delivering government services to the public is not similar to what the private sector provides for its customers. Government services cover not just information and financial transaction, but also include how citizens are involved in government projects and public administration. Citizens are not the same as customers (Stahl, 2005). Measurement tools in the private sector tend to focus on objectives, not customers' preferences (Marchand & Raymond, 2008; Weinstein, 2009).

Citizen participation is studied and evaluated separately from other government services, such as the UN E-participation Index (Rorissa, et al., 2011; United Nations, 2010, 2012). The measurement framework for e-government service delivery covers government services but not the participation aspect, for example, financial terms (Marchand & Raymond, 2008), benchmarking (Rorissa, et al., 2011; Salem, 2007), and website quality (Barnes & Vidgen, 2008; Miranda, et al., 2009).

Application of frameworks from other perspectives should be able to facilitate the measurement of e-government service delivery and encompass measures for citizen participation into e-government service delivery.

b) Researchers have more opportunities to explore and learn from other disciplines.

Creating a measurement instrument requires systematically going through applications of theories in various research fields. The nature of the studies in e-government and e-participation initiatives is a cross-disciplinary research (Sæbø, et al., 2008). Government websites are created using ICT knowledge within the scope of public administration and government environment. However, knowledge from other sectors are employed to enhance service delivery such as electronic commerce (Chang, Chang, Ho, Yen, & Chiang, 2011; Kim, Galliers, Shin, Ryoo, & Kim, 2012) and education (Balaban, Mu, & Divjak, 2013).

When ICT is applied in public administration, citizens can input their ideas and exercise their political processes via government websites. Assessment is not only limited to the level of satisfaction in information and services, but also in participation in the administration and projects. Researchers can explore what measures should be added to evaluate citizen participation in an e-government setting.

Practitioners' contribution

a) Practitioners at the operational level are able to apply the instruments to evaluate the websites of their government agencies.

Government agencies are bound to determine whether citizens are content with the information and services. With ICT-enabled government, questionnaires are uploaded on the websites of government agencies asking about the level of satisfaction. There is no information about the questionnaires, such as the types of question, the number of questions, and the number of choices. Comparisons with other agencies are not applicable.

It is important that government agencies should use a systematically produced questionnaire to evaluate the level of satisfaction. The results can be compared within the unit and with other units, and they can be linked to policies and strategies.

b) Decision and policymakers have a better understanding of the multifaceted nature of e-government service delivery.

Policymakers are able to use data from the assessment framework and the measurement instrument professionally. Generally, policies and strategies are established by the government, for example, IT 2010, IT 2020, and ICT Master Plan (Ministry of Information and Communication Technology, 2011; National Electronics and Computer Technology Center, 2009; National Information Technology Committee Secretariat, 2003). Government agencies adopt those policies and strategies as guidelines to provide services to the public. Evaluation of the outcomes is obligatory, but connecting the evaluation results from a citizen's perspectives to the policies and strategies is more obscure.

As stated in the Royal Decree on Criteria and Procedures for Good Governance 2003, feedback from citizens is an important element. It can assist the aligning process and improve future policies for better e-government service delivery. The policies and strategies can be reviewed and adjusted in accordance with citizens' needs (Office of the Public Sector Development Commission, 2003).

c) Developers are able to use measurement tools, and the results function as guidelines for improvement and development.

The demands of users are not limited to the design and user-friendly features. There are other features affecting the usage and level of satisfaction, such as

the quality of the information, the system, and the services. Joanne M Kuzma (2010) explored websites for the UK Parliament as to whether they met guidelines for disabilities. The results are useful for web designers to improve accessibility and greater to people with disabilities (Kuzma, 2010). The development of IT is an evolving and fast moving area, and the results from the evaluation can be incorporated with the latest IT available to make better e-government services.

1.9 Organization of Research

The dissertation comprises five chapters: (1) introduction, (2) literature review, (3) research method, (4) results of the study and discussions, and (5) conclusions and recommendations for future research.

The research problems, research questions and objectives of this research study are introduced in chapter 1 including contributions and limitations. Chapter 2 reviews the uniqueness of e-government and e-participation initiatives, citizens' characteristics and their roles, and the advantages and disadvantages of current evaluation methods. Chapter 3 elaborates the research design and methodology for instrument development. Chapter 4 is related to Construct Development Methodology including the results of the pilot and the main study. Chapter 5 includes discussions, conclusions, implications, limitations and recommendations for future research studies.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The success of governments in applying ICT to public administration involves the assessment of e-government and e-participation initiatives. ICT is applied as a strategic tool in Thai public administration (National Electronics and Computer Technology Center, 2009; United Nations, 2008). The current evaluation methods for e-government and e-participation initiatives are performed separately. Government services are placed on government websites for the benefit of the same users, who are mainly citizens. The similarity of e-government and e-participation initiatives shows a possibility of measuring both initiatives together.

Websites are considered as an additional method to deliver and make services available to citizens (United Nations, 2001). Traditional channels of services are still offered, such as face-to-face meetings, telephone calls and facsimile. With ICT-enable services, the demands of citizens have been adjusted and require government officials to offer round-the-clock services (24/7) (Aksararak & Pornwasin, 2004; Brown, 2005; United Nations, 2008).

The use of ICT has amplified the ability of government to provide information and services through the latest technology and engage citizens in the political processes. Government websites are the gateway for citizens to access government information and services, and connect citizens to their government at

anytime and from anywhere. The application of ICT has brought about the improvement of government services (see Table 1).

Table 1 Comparison of traditional services and ICT enabled services

	Traditional Services	ICT Enabled Services
Place	- Government offices (Surjadjaja, Ghosh, & Antony, 2003).	- Websites (Aksararak & Pornwasin, 2004; National Electronics and Computer Technology Center, 2009; Surjadjaja, et al., 2003; United Nations, 2012). - Kiosks (Surjadjaja, et al., 2003). - Service centers (Surjadjaja, et al., 2003).
Time	- Office hours or opening hours (Surjadjaja, et al., 2003).	- Any convenience time (Aksararak & Pornwasin, 2004; National Electronics and Computer Technology Center, 2009; Surjadjaja, et al., 2003).
Procedure	- Manual both front and back office system (Surjadjaja, et al., 2003). - Limited computerization, in back office system (Surjadjaja, et al., 2003).	- Self-service through internet connection (Surjadjaja, et al., 2003). - Computerized and integrated system (National Electronics and Computer Technology Center, 2009; Surjadjaja, et al., 2003).
Process of Delivery	- Slow (Miranda, et al., 2009). - Waiting in line for services (Miranda, et al., 2009).	- Faster (Aksararak & Pornwasin, 2004; Miranda, et al., 2009; National Electronics and Computer Technology Center, 2009). - Online using websites (Miranda, et al., 2009; National Electronics and Computer Technology Center, 2009).

Source: Developed for this research

Citizens have more choices when interacting with government officials and agencies. The nature of e-government service is quite different to traditional public services. Citizens may not need to go to the governmental offices to obtain information and the necessary forms needed for action to take place. In some cases, there is no need for face-to-face conversation with any government officials. Location

is not limited to government offices. Citizens can browse through information on the websites or acquire services outside office hours. Citizens can decide where and when to access government services. Websites are used as interfaces between government officials and citizens. Barriers of location of government offices and the opening hours are eliminated. Citizens are able to access online services wherever and whenever they are required (Aksararak & Pornwasin, 2004; National Electronics and Computer Technology Center, 2009; Surjadjaja, et al., 2003).

However, kiosks and service centers require citizens to be present at the location and request government services. The back office system is integrated and linked to government agencies. Services are provided in various locations, not just government offices. Difficulties of location and time are solved (National Electronics and Computer Technology Center, 2009; Surjadjaja, et al., 2003).

The procedures for both front and back office systems are traditionally manual, with limited computerization. Integration within and among government agencies was rare. New technology leads to cooperation, collaboration, and integration of public administration. ICT makes it possible for citizens to interact with government officials and government agencies from anywhere at any time. Citizens can apply for, contact or obtain services via websites such as forms that can be downloaded online, complaints that can be sent via the email addresses of government agencies or by discussion through web boards (National Electronics and Computer Technology Center, 2009; Surjadjaja, et al., 2003).

The service delivery processes using traditional service delivery are slow with long waiting times and long queues. With facilitation from ICT, citizens can obtain services faster through websites. The web environment offers governments

opportunities to deliver information and services to enhance communication to and between its citizens and to provide means for citizens to interact with government officials (Aksararak & Pornwasin, 2004; Miranda, et al., 2009; Panopoulou, Tambouris, & Tarabanis, 2009).

E-government and e-participation initiatives are created using ICT to enable the delivery of government services. They are introduced in Chapter 2 including their benefits and development in Thailand. Similarities of both initiatives are explored. The available evaluation schemes are discussed. The advantages and disadvantages of each scheme are examined with an explanation of why a new conceptual framework is required.

2.2 E-government and E-participation Initiatives

Electronic government (e-government) is established by the government using emerging technology, ICT, to facilitate better public administration and encourage citizens to become involved in government projects and works. Governments in many countries have set up e-government projects to respond to citizens' priorities and provide seamless, connected services delivered through government websites and the Internet. Citizens have more choices to connect, interact, and be involved with their government.

2.2.1 What is e-government?

E-government has become a global agenda and has been studied by many research institutes, academic institutions, and international organizations. The definitions, benefits, implementations and achievements in each country including Thailand are diverse. The definition of "e-government" has been characterized by a

variety of the private research institutes and international organizations. Samples are as follows:

- The Organization for Economic Co-operation and Development (OECD) refers to e-government as "the use of ICT, and particularly the Internet, as a tool to achieve better government" (The Organisation for Economic Co-operation and Development, 2003).
- The European Union defines e-government as "the use of ICT in public administration combined with organizational change and new skills in order to improve public services and democratic processes and strengthen support for public policies" (as stated in Commission of the European Community, 2003)[1].
- The World Bank defines e-government as "the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government"[2].
- The United Nations E-government Survey defines e-government as utilizing the Internet and the world-wide-web for delivering government information and services to citizens (United Nations, 2001, p. 1). The definition is adjusted to the use of ICT and its applications by the government for the provision of information and public services to the people (United Nations, 2004, p. 15; 2005).
- The Thai Information Technology Policy Framework 2001-2010 (IT 2010) refers to e-government as the application of electronic means in public

[1] http://europa.eu/legislation_summaries/information_society/strategies/l24226b_en.htm
[2] http://web.worldbank.org

administration and services with the goal of building a Knowledge-Based Society, creating good governance and enhancing competitiveness, leading to a higher quality of life for Thai society (National Information Technology Committee Secretariat, 2003).

The main purpose of ICT usage is to increase the efficiency and effectiveness of government services rendered to its citizens. Citizens are the major element of success or failure of the initiatives (National Electronics and Computer Technology Center, 2003, 2009; Office of the Public Sector Development Commission, 2003). E-government initiatives invariably focus on the use of ICT in public administration for the benefits of citizens and public administration.

a) Benefits of e-government initiatives

Today's governments have found that there are several benefits of e-government initiatives including:

- An increase in the efficiency of the administration of government agencies (Aksararak & Pornwasin, 2004; Phippen & Lacohee, 2006; United Nations, 2001, 2008, 2010, 2012);
- An increased quality of government services to its citizens (United Nations, 2008, 2010, 2012);
- Improved interaction of government and citizens empowering citizens with information (United Nations, 2008, 2010);
- A reduction in the cost of administration systems and the delivery of government services (D. Brown, 2005, p. 248; Office of the Public Sector Development Commission, 2003; United Nations, 2001, 2008);

- Strengthening the linkage between the private sector and the government and facilitating public contribution of opinions to state policies and laws (Ariunaa, 2008, p. 4103);
- A mediator between complex political and administrative structures and citizens through public administrators (Brewer, Neubauer, & Geiselhart, 2006);
- Increased transparency of actions of governments (Austin & Callen, 2008; United Nations, 2001), and
- Increased national competitiveness (Aksararak & Pornwasin, 2004; National Electronics and Computer Technology Center, 2009; National Information Technology Committee Secretariat, 2003).

E-government development has removed the barriers of time and distance. Citizens are able to access government information and services through websites and an Internet connection at anytime and from anywhere. Government agencies have changed and adjusted the delivery of services using the latest technology and better interact with citizens, including the private sector (Guo & Lu, 2008).

b) E-government Development in Thailand

The Thai government has incorporated ICT into its policies and the reform plan in 1996. The aim of using ICT is to increase the efficiency and effectiveness of public administration and to provide government services to the public. The reform process involves the administrative processes and environment, methodology, communication, and the roles and responsibilities of government (Aksararak & Pornwasin, 2004).

E-government projects were created in 2000 together with the IT 2000 Policy Framework (National Information Technology Committee Secretariat, 2003).

More budgets and investment were geared towards the improvement of infrastructure, reengineering the work processes and human capacity development. IT policy is included in Public Administration Reform in order to facilitate the development of public administration and the government work processes[3].

Table 2 E-government development in Thailand

Time	Policies and Plans
2011-2020	IT 2020 (National ICT Policy Framework)
2010	Proposal to create a national organization overseeing the e-government initiative
2010	Preparation and the consultation processes of IT 2020 (National ICT Policy Framework)
2009-2013	ICT Master Plan 2
2002-2006	ICT Master Plan 1 (extended to 2008)
2002	Establishment of Ministry of Information and Communication Technology (MICT)
2001-2010	IT 2010 (National ICT Policy Framework)
2000	E-ASEAN and E-Thailand initiatives
1996-2000	IT 2000 (National ICT Policy Framework)

Source: Developed for this research

In 2000, the ASEAN members agreed to create the "e-ASEAN Initiative (Electronic Associations of Southeast Asian Nations)" in order to develop a regional ICT perspective and to increase the competitiveness of the region. The Thai government set up "e-Thailand" to connect Thailand with the region. E-Thailand consists of fives pillars; e-commerce, e-education, e-industry, e-society and e-government. Each country has created its portal site as an electronic gateway to

[3] http://www.opdc.go.th/english/main/content_view.php?cat_id=5&content_id=79

government information and services for its citizens. The portal site of Thailand is www.ecitizen.go.th.

In March 2001, the Cabinet approved e-government projects including public services, public administration management, and collaboration and communication. The principles of e-government services to citizens are transparency, usability, accessibility, equality, and timelessness. In 2002, the Ministry of Information and Communication Technology (Ministry of ICT) was launched to lead the e-government development projects and the coordination of government agencies including other ICT related projects such as e-procurement, e-citizenship, and the smart card (Aksararak & Pornwasin, 2004; National Electronics and Computer Technology Center, 2003).

The Tenth National Economic and Social Development Plan 2007-2011 emphasized the use of ICT to reinforce good governance in national administration in all sectors to strengthen democratic knowledge (National Electronics and Computer Technology Center, 2009). As stated in the Thai Royal Decree on Criteria and Procedures for Good Governance (2003), ICT was recommended to be employed to lessen the steps of work, increase effectiveness and save cost. Each government agency is able to decide which system and applications to be utilized within its strategic objectives and budgets (Office of the Public Sector Development Commission, 2003). The use of World Wide Web technology, especially websites, and the Internet provide additional channels for government service delivery to its citizens. Citizens have more choices to access government services through online connection (Aksararak & Pornwasin, 2004).

The ICT Master Plan 1 (2002-2006) was created in accordance with IT 2010 by the National Electronics and Computer Technology Center (NECTEC), and the Ministry of Science and Technology. Key strategies were launched and utilized ICT to strengthen the nation's competitiveness and enhance the quality of life of the citizens. Rules and regulations are reviewed to facilitate the use of ICT in the public and private sectors (National Electronics and Computer Technology Center, 2003).

The ICT Master Plan 2 (2009-2013) was crafted following the analysis and results of the achievement of the ICT Master Plan 1 (2002-2006). The key strategies were adjusted to cope with new trends, such as the increasing number of mobile phone and Internet users, and the development of social networking and the online community. The vision changed to "Driving toward a Smart Thailand through ICT". The weaknesses and issues in the ICT Master Plan 1 have been used to adjust the ICT Master Plan 2 (National Electronics and Computer Technology Center, 2009).

The National IT Policy Framework 2011-2020 (IT 2020) has been proposed and is in the process of eliciting public inputs and opinions. Citizens are invited to express their ideas and share their knowledge at www.ict2020.in.th. Other methods of public consultation are continually organized throughout the country, such as seminars and workshops with key stakeholders and the private sector. Academics and experts in ICT are invited to attend workshops that are organized regularly on related topics (Ministry of Information and Communication Technology, 2011).

Thai government has employed and has continued to use ICT as a strategic tool in public administration. The benefits have increased efficiency and effectiveness to boost national competitiveness and enhance citizen participation. More tools are implemented to reach a wider citizen group, such as social networks and online

voting. E-government initiatives are considered as a crucial strategy for Thai government.

2.2.2 What is e-participation?

"E-participation", also known as "electronic participation", occurs when government makes use of ICT to enhance the participatory processes for its citizens. . The application of ICT in public administration has been extended to facilitate the participation of citizens. Citizens are getting closer to their government. Currently, there is no widely accepted definition of e-participation (Sæbø, et al., 2008).

"Participation" means "joining in" either in the sense of taking part in an activity or taking roles in decision-making. Participation is considered as an important part of political processes. It can be in the formal political process (such as voting) or outside (such as political activism). The use of new technology, the World Wide Web and Internet connection, has changed how citizens interact with government and how government engages with its citizens. The political processes are enhanced and citizen involvement has shifted to ICT-enabled channels (Sæbø, et al., 2008; United Nations, 2003).

Macintosh and Whyte (2008) defined e-participation as "the use of ICTs to support information provision and top-down engagement or ground-up efforts to empower citizens, civil society organizations and other democratically constituted groups to gain the support of their elected representatives". ICT is viewed as a tool to enable citizens' ability to engage in the political processes (Macintosh & Whyte, 2008; Tambouris, Liotas, & Tarabanis, 2007).

The application of ICT in public administration has extended the advantages from government services to support the participation of the public.

Citizens are able to exercise their roles and duties through the websites of government agencies. The political processes are improved through the use of ICT.

a) Benefits of e-participation

The benefits are not limited to technological and economic gains. It is extended to facilitate the participation environment and to enable citizens to fulfill their citizenship. For example; the key benefits for the UK government are expected to include wider participation; reduced social exclusion; improvements in information sharing between services and agencies; greater variety, choice and convenience of access for customers; and improved speed and efficiency of the processes which underpin services (Phippen & Lacohee, 2006).

The UN E-government Survey mentioned that the goal of the e-participation initiative is to increase citizen accessibility to information and public services through (a) increasing e-information to citizens for decision-making, (b) enhancing e-consultation for deliberative and participatory processes, and (c) supporting e-decision making by increasing the input of citizens in decision-making (United Nations, 2004, 2005, 2008, 2010). Other benefits are as follows:

- To support active citizenship (Sæbø, et al., 2008);
- To increase access to, and the availability of, participation to promote a fair and efficient society and government (Sæbø, et al., 2008);
- To increase the ability of citizens to participate in digital governance including involvement in political processes and the transformation towards digital government information and services (Macintosh, 2004; Ministry of Information and Communication Technology, 2011; Sæbø, et al., 2008); and

- To be applied as a medium to tackle the political challenges of democratic societies and to reconnect people with politics and policy-making (Panopoulou, et al., 2009).

b) E-participation in Thailand

The public sector is required by statute to consult their constituents (Donnelly, 1999). Thai government has paid attention to the engagement of citizens in government projects and public administration. The Royal Decree (2003) has emphasized public opinions and the pleasure of users from the beginning of every government mission and project. The consultation processes can be carried out through various methods. Workshops with business leaders, public authorities and specialists are often held, and permit the participation of citizens (Office of the Public Sector Development Commission, 2003). For instance, a workshop organized by the Ministry of Social Development and Human Security asked for ideas on the Human Development Plan (http://www.m-society.go.th/opportunity.php).

Soliciting a national agenda is performed through ministry websites or specially created web pages. The dedicated website for the current government is called public consultation (http://www.publicconsultation.opm.go.th) created by the Office of the Prime Minister. Government projects are regularly posted and the opinions of the public are elicited. Other websites include public consultation about amendments to the law (http://www.lawamendment.go.th/), the law reform plan (http://www.legalreform.go.th/) and the website of the Prime Minister of Thailand (http://www.pm.go.th). The National ICT Policy Framework 2011-2020 also uses a website (http://www.ict2020.in.th/) to seek opinions from the public. Other ministries are able to obtain feedback on their projects using their websites.

The study of e-participation in Thailand has recently emerged. The focus is on e-democracy development and e-parliament (Kanthawongs & Lee). Suree Funilkul and Wichian Chutimaskul (2009) studied a framework for sustainable e-democracy development which was intended to be used as a guideline to craft a tool to support the democratic system. The principles of democracy are applied together with ICT and create e-democracy applications; e-information, e-services, e-voting, e-complaint, and e-forum (Funikul, et al., 2006). More and more government websites have used government websites to enhance citizen participation at ministerial and departmental levels. ICT continues to be a strategic tool for the Thai government to include citizens in the political processes (Office of the Public Sector Development Commission, 2003).

The applications of ICT in public administration have impacts on both government services and how citizens communicate with their government. The Thai government has continually included ICT in the policy frameworks and ICT Master Plan. A government website is able to offer government services and assist the involvement of citizens in the political processes. The assessment of e-government service delivery can facilitate the understanding of citizens' requirements.

2.3 Evaluation Methods

The evaluation methods for traditional services are different from e-government services. Citizens have to appear and request information and services at government offices. Factors influencing the level of satisfaction are distinctive, such as opening hours, location, waiting time, the number of visitors and the officials themselves. Samples of the measurement of performance and the level of satisfaction

are the Malcolm Baldrige National Quality Award (MBNQA) and the Balance Score Card (BSC). These methods are rarely applied to evaluate e-government services and e-participation. Specific evaluation methods are produced to assess e-government service delivery.

2.3.1 Quantitative Evaluation

Quantitative evaluation can be applied for both e-government and e-participation initiatives. Service providers, in general, use site-centric approaches to portray the characteristics and behavior of their online users. Commercial software uses site-centric approaches to analyze the data in numerical forms, such as the number of visitors, the number of searches, and the most popular pages. The software application is not expensive and is quite easy to use. The reports are presented in numerical terms. Numbers are easy to read and understand. However, information gathering is very simple and might not be useful in terms of marketing and policy making (Miranda, et al., 2009).

Site popularity can be utilized to assess the accessibility to websites. The number of "hits" is employed to evaluate web performance. Hence, the number of hits can be artificially increased. The total number of hits does not accurately reflect the number of visitors. "Link popularity", on the other hand, is free software to check and compare the search engines on websites. It applies a number of external links as indicators that point to the analyzed websites. More links mean more traffic to the website and could eventually promote its products and services. Attracting more visitors to the business or commercial websites is more important than to government websites (Marchand & Raymond, 2008; Miranda, et al., 2009, pp. 427-428).

Search engines also offer evaluations of websites, especially ranking. A high ranking means traffic to the site is high. An example of a search engine providing ranking is Google (Miranda, et al., 2009). Rankings on search engines have created a new way to promote products and services in the business sector called "search engine marketing". It is an internet promotion tool to increase the visibility of websites on search engine result pages[4]. The higher the visitor numbers, the higher the revenue and benefits.

Quantitative evaluation can be applied for both e-government and e-participation initiatives. The reports are presented in numerical terms. Numbers are easy to read and understand. However, information gathering is very simple and might not be useful in terms of marketing and policy making. Hence, the number of hits can be artificially increased. The total number of hits does not accurately reflect the number of visitors (Miranda, et al., 2009, pp. 427-428).

2.3.2 Financial terms

In business practice, a financial statement is a preferable term that is able to explain the incremental value of the investment. Senior management and stakeholders use the estimation for decision making of future investments. The most popular financial calculations to evaluate the impact of IT investment are Return on Investment (ROI), Return on Assets (ROA) and earnings-per-share (Marchand & Raymond, 2008).

Financial calculations and analysis are applied only for intra-organization practice (Marchand & Raymond, 2008). The terms are useful for resource allocations

[4] http://en.wikipedia.org/wiki/Search_engine_marketing

and performance management. Estimation in financial terms cannot evaluate the level of user satisfaction and their feedback. Financial statements assess the past performance of an organization. It is unable to be applied to portray the big picture of organizational performance and is insufficient to guide the decision-making procedure (Weinstein, 2009).

Intangible assets have become a major source of competitive advantage such as employee knowledge, customer relationships and innovative cultures. Companies are moving towards the management of intangible assets in order to develop knowledge-based strategies. The cornerstone of an operational and management control system is shifted to extend the focus from financial achievement to strategic objectives (Weinstein, 2009).

Government agencies are required to consider more than financial statements in accordance with the Royal Decree on Criteria and Procedures for Good Governance 2003 and the Public Sector Reform Initiatives. The focus is upon citizens' needs, value for money, increased efficiency of administrative work and better quality government services (Office of the Public Sector Development Commission, 2003). These are intangible assets that cannot be captured using only financial statements (Chavan, 2009; Weinstein, 2009).

Accounting is only part of an organization whereby a monetary statement can be analyzed and displayed. ICT, on the other hand, has the ability to enhance service quality beyond a single measurement. ICT can be utilized to increase the continuing improvement of operations, enhance development at managerial levels and provide a better decision-making system (Marchand & Raymond, 2008).

2.3.3 Benchmarking

Benchmarking is a method used to identify best practices with the aim of improving the performance of an organization. Systematically seeking better practices throughout the organization is the key to the benchmarking approach. Once the best practice is discovered, improvement of performance can be done following the best practice (Henry, 2001; Keehley & MacBride, 1997). Benchmarking is employed to facilitate cross-organizational comparisons (Rocheleau, 2000).

Using benchmarking involves cost and it is difficult to establish how much an organization is willing to spend. In the private sector, organizations can employ a benchmarking approach to gather information about competitors and adjust their strategies to gain more competitive advantages in the market (Bannister, 2007). Competitive advantages can lead to more profits, thus the company is keen to invest more.

Benchmarking for e-government development is created for different purposes, such as to sell research findings for marketing reasons, and for academic purposes. The results are compared between group members. If the reports are commissioned, they are paid and done on behalf of a government, a state agency or a research institute. Their research is designed to meet a specific objective of the person who is paying (Bannister, 2007; Rorissa, et al., 2011).

Government is able to use benchmarking to find better services within departments and compare other departments and ministries. Problems can be discovered and solved or subsequently improved. Criteria for performance measurement can also be found and used when making comparisons (Keehley & MacBride, 1997; Salem, 2007).

There are many international organizations studying and utilizing benchmarking for e-government initiatives: the UNPAN (United Nations Public Administration Network), eEuropa, Accenture's e-government leadership reports and the Brown University Global e-Government Survey, Online Availability of Public Services (EC-Capgemini), Benchmarking e-Government in Europe and the US (RAND Europe) and e-Government in Central Europe (Economist Intelligence Unit) (Rocheleau, 2000; Salem, 2007).

The UN applies a benchmarking method in order to gain understanding of the global e-government development and to gather data to test and improve an assessment instrument. Every member state is able to mark its continual success including the development of specific programs. Adjustment and improvement can be done at any stage to increase efficiency and value for money (United Nations, 2001, p. 10; 2010). Benchmarking is useful at a global level. Comparisons among member countries are strategically beneficial to decision-makers and senior management including government. However, comparison could lead to the adjustment of strategic objectives to focus on increasing performance of the agencies instead of the needs of citizens. Each country might decide to work and adjust its e-government project towards global benchmarking instead of providing better quality of services for its citizens (Bannister, 2007).

Benchmarking cannot be applied alone for evaluation. An evaluation framework and methods have to be chosen so that the results can be compared. Each organization uses different methods to evaluate and compare between its groups or members. Research methods can be either qualitative, quantitative or a mixed-method approach (Salem, 2007). It is useful only if an assessment method and standards are

set. Organizations, industries or groups have to agree on what to measure, what the definitions are, what procedure is appropriate and how to compare results within the groups (Jansen, Vries, & Schaik, 2010; Panopoulou, et al., 2008, p. 520).

A benchmarking approach is not a reliable tool for measuring e-government development. The ways of measuring performance have changed from year to year. The benchmarking metrics change with time. The results could be interpreted as the best practices or the under-performance of any government agency (Bannister, 2007). Criticism of benchmarking in the international arenas focuses on the supply side and compares between members of its group. The demand side or users is a limited concern (Panopoulou, et al., 2008, p. 520).

2.3.4 Citizen Satisfaction Model (CSM)

The Citizen Satisfaction Model (CSM) was initiated in relation to the obligation to set a standard for e-government evaluation for country members in the European Union (EU). Citizen perspectives are the focal point of the initiatives. CSM is a part of the eCitizen oriented Evaluation of E-Government Services (CEES) project funded by the EU. It is a three-year project started in 2009 with the collaboration of EU academic institutions and the private sector. The aim of CSM is to be employed by the EU members, and the characteristics of its members are included (H. Lee, et al., 2008). The stage model and Data Envelopment Analysis (DEA) is applied as a framework in order to evaluate e-government services and includes other factors such as culture, the maturity of government systems and the relationships of the applying countries. The determination of citizen satisfaction is related to the maturity of the e-government system. The expectation of services is

different at different maturity levels (H. Lee, et al., 2008). CSM is in the development process.

2.3.5 Website Quality

Websites are the key to online trading of products and services. The evaluation of the quality of online services have been widely studied in the private sector in many industries, such as the airline industry (Xie & Barnes, 2008/2009), e-commerce (Webb & Webb, 2004) and online shopping (Bressolles & Nantel, 2008). The satisfaction of customers including their online behavior brings more revenue and profits to owners and stakeholders.

Website quality tools have gained more attention in measuring e-government services in recent years (Panopoulou, et al., 2008). Web service quality is exercised to assess government websites objectively to avoid subjective measurement. See the sample list of dimensions in Table 3.

In 2008, Stuart J. Barnes and Richard Vidgen applied the E-Qual Index to evaluate websites of the Inland Revenue in the UK. Users interacted online with the online taxation system. A qualitative approach was employed to search for insights from users. The results, including difficulty in the delivery of e-government initiatives, were used to improve the websites and services to meet the expectation of users.

In 2009, Miranda, Sanguino and Bañegil applied a Web Assessment Index to assess websites of European municipal governments based on 4 categories: Accessibility, Content, Navigability and Speed. The official websites of 84 cities with native languages were evaluated and the results found relationships between citizens and e-government capacity at the local level.

Governments in China and Greece evaluated the quality of the websites to meet the needs of their citizens (Papadomichelaki & Mentzas, 2012; Rorissa & Demissie, 2012; Yuan, Xi, & Xiaoyi, 2012). Websites at a local level are dynamic and a highly changeable medium and regular evaluation is recommended in order to improve services to meet the local needs (Miranda, et al., 2009).

Table 3 Examples of measurement tools for website quality

Model	Dimension	Industry	Author
.comQ	Customer service, Privacy / security, Reliability, Website design	Retail business	Wolfinbarger and Gilly 2002
WebQual	Ease of use, Usefulness, Entertainment, Complimentary Relationship, Customer Service	Commercial website	(Loiacono, Watson, & Goodhue, 2002)
SiteQual	Service quality (Reliability, Assured empathy), Data quality (Perceived usability, Trustworthiness)	E-commerce websites	(Webb & Webb, 2004)
E-Qual	Empathy, Design. Information, Trust, Usability	Website of the Inland Revenue, UK government	(Barnes & Vidgen, 2008, p. 1139)
NetQual	Quality and quantity of information available, ease of site use, design, reliability, security	Online customers in travel, insurance, digital products, and energy	(Bressolles & Nantel, 2008)
Web usability	Design, Navigation, Content, Accessibility	Tax filing websites of Korean and Turkish government	(K. C. Lee, Kirlidog, Lee, & Lim, 2008)
Web Assessment Index (WAI)	Accessibility, Content, Navigability, Speed	European municipal websites	(Miranda, et al., 2009)
Government Portal Performance Architecture	Content, Function, Construction	Chinese government portals	(Yuan, et al., 2012)
E-GovQual	Ease of Use, Reliability, Trust, Citizen Support, Functionality of the interaction environment, Content & Appearance of Information	Greece government portals	(Papadomichelaki & Mentzas, 2012)

Source: Developed for this research

Web service quality focuses on quantitative and objective assessment of websites. Features of websites are at the center, such as accessibility, speed, navigability, the adjustment of content, and the improvement of services to meet user requirements. Measurement is compliant with the processes and predetermined outcomes of set criteria. Criteria are normally generated by service providers, in this case, the government. The focus is placed on the supply side (Marchand & Raymond, 2008; Miranda, et al., 2009; Salem, 2007; Weinstein, 2009). The demands of users are provided in accordance with the objectives of providers

2.3.6 Stage Model

The stage model has been widely studied and applied to assess the development of e-government initiatives. Examples of the stage model are shown in Table 4.

Table 4 Examples of the stage model for e-government development

Author(s)	Model name	No of stage	Dimension
Karen Layne and Jungwee Lee (2001)	Four Stage Model	4	Cataloguing, Transaction, Vertical integration, Horizontal integration
M Jae Moon (2002)	Stage of e-government	5	Information dissemination / catalogue, Two-way communication, Service and financial transaction, Vertical and horizontal integration, Political participation
Darrell M West (2004)	Stage of e-Government Development	4	Billboard stage, Partial-service-delivery stage, Portal stage, Interactive democracy
King Siau and Yuan Long (2005)	5 e-Government Stage Model	5	Web presence, Interaction, Transaction, Transformation, e-democracy
Alessandro Ancarani (2005)	Evolutionary path	4	Formal institutional function, Simple information, Two-way communication, Transactions
K.B.C. Saxena, as cited (Saxena, 2005)	Implementation of e-government	3	Publish, Interact, Transact
France Belanger and Janine S Hiller (2006)	Stage of electronic government	5	Information, Two-way communication, Transaction, Integration, Political Participation
John F. Affisco and Khalid S. Soliman (2006)	E-government service delivery	3	Publishing, Interacting, Transacting
P. Wauters (2006)	Four-stage framework of e-Europe Programme	4	Information, One-way interaction, Two-way interaction, Full electronic case handling
Peter Shackleton, Julie Fisher and Linda Dawson (2006)	Electronic Service Delivery Model	4	e-Management, e-Service, e-Commerce, e-Decision-making / e-Governance
Kim Viborg Andersen Helle Zinner Henriksen (2006)	Public Sector Process Rebuilding (PPR)	4	Cultivation, Extension, Maturity, Revolution
Xuetao Guo and Jie Lu (2008)	Development model of e-government online services	4	Information and service online, Transaction-based online, Integrated online services and Intelligent online services
Gwanhoo Lee and Young Hoon Kwak (2012)	Open government maturity model (OGMM)	5	Initial Conditions, Data Transparency, Open Participations, Open Collaboration, Ubiquitous Engagement

Source: Developed for this research

The stage model is an incremental model. The progress is increased in a stepwise and straight-forward style. Each model consists of 3 to 6 stages. The beginning stage starts with simple information provision, one-way communication and distribution. More services, financial transactions, two-way communication, and political participation are added at the later stages (M. M. Brown, 2007).

A four stage model was designed by Karen Layne and Jungwee Lee in 2001 to explain the structural transformation of government development towards e-enabled government. The four stage model consisted of cataloguing, transactions, vertical integration and horizontal integration. 'Cataloguing' involves the online presence of government units to provide information on websites such as downloadable forms and general information. 'Transactions' provide more active participation with citizens in terms of two-way communication. Citizens are able to access services and forms with online databases to support transactions. The demands of citizens coupled with government processes, have changed. Integration within government units and with other agencies is required to provide seamless services to its citizens. Vertical integration involves local systems linked with higher systems within similar functions. Horizontal integration focuses on collaboration across different functions and provides a real one-stop-service for citizens (Layne & Lee, 2001).

King Siau and Yuan Long (2001) on the other hand, studied five e-government stage models including Gartner's four stage model (2000), Layne and Lee's four stage model using meta-synthesis based on a meta-ethnography approach and aligned the stages. The five stage model aimed to present development trends and conceptual frameworks rather than the growth of e-government projects. The model

consists of web presence, interaction, transactions, transformation and e-democracy (Siau & Long, 2005).

Alessandro Ancarani (2005) studied the relationship between technological complexity of e-service paths and benefit realization. A four phase model was proposed for the evolutionary path of a website in local public services: phase 0 (formal institutional function), phase 1 (simple information), phase 2 (complex information with two-way communication) and phase 3 (two-way communication and transactions). Progress is developed through the level of technological complexity and benefit gains through each phase (Ancarani, 2005).

Peter Shackleton, Julie Fisher and Linda Dawson (2006) utilized an Electronic Service Delivery Model to evaluate the websites of local councils in Australia. The model consisted of four stages; e-Management, e-Service, e-Commerce and e-Decision-making / e-Governance. The linear e-commerce and e-government stage model proved to be unsuitable to measure e-government services at the local level. Service delivery in each council tends to mature at different rates in different function areas (Shackleton, 2006).

Researchers continue to apply stage models for e-government measurement, hence, the focus has moved to national and local levels. For example, Kim Viborg Andersen and Helle Zinner Henriksen (2006) applied the Public Sector Process Rebuilding Model to improve the core activities and bring end-users as the key stakeholders for future e-government investments (Andersen & Henriksen, 2006). Xuetao Guo and Jie Lu (2008) applied a development model for online e-government services. Online services are being focused for e-government initiatives in Australia. The model is a stage model that was developed in accordance with the level of

interaction and complexity of online services (Guo & Lu, 2008). Gwanhoo Lee and Young Hoon Kwak (2012) applied a stage model to assess open government in the US healthcare administration agencies. The public was encouraged to contact their government through social media. The results showed that adjustments should be made in accordance with local needs in order to increase public engagement (G. Lee & Kwak, 2012).

The stage model has been widely studied and applied to evaluate e-government initiatives at local and national levels. Government agencies can use the details in each stage to evaluate the progress of their websites and learn from each other. However, the number of stages and boundaries are not the same, and the results cannot be compared with other government agencies or organizations.

2.3.7 The UN E-government Survey

The United Nations (UN) has produced an evaluation scheme for e-government initiatives to compare the development and progress among its member states. The UN E-government Survey employs a combination of the E-government Readiness Index and the E-participation Index and uses a ranking system to benchmark among member states. The statistics of the two indexes are obtained from member states. The survey began in 2001 and the latest one was reported in 2012 (United Nations, 2001, 2003, 2008, 2010, 2012).

a) E-government Development Index

The scores of the E-government Development Index (EGDI) derive from the Online Services Index (the assessment of the national portals and five government websites) plus two indices: the Telecommunication Infrastructure Index and the Human Capital Index (See Figure 1).

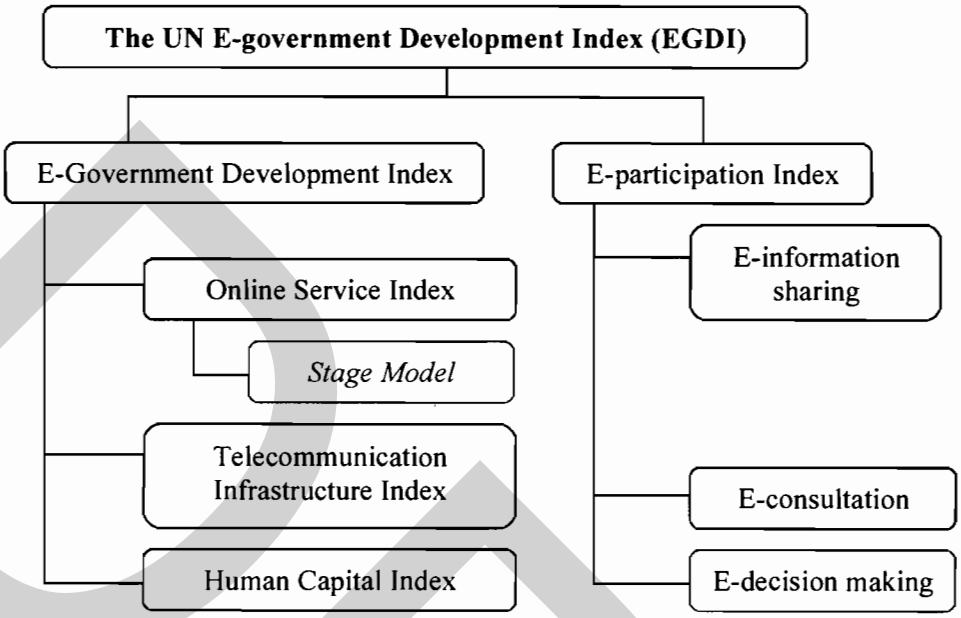

Figure 1 Measures for the UN E-government Development Index (EGDI)

Source: Developed for this research

The evaluation of government websites is performed in the Online Service Index. The model is a stage-like form, see Table 5. It started with 5 stages in 2001 and was reduced to 4 in 2010. The definition and scope of each stage was reviewed and the Interactive Stage was removed. The name "E-government Readiness Index" was replaced by "E-government Development Index" and "Web Measure Index" was changed to "Online Service Index" (United Nations, 2001, 2010).

Table 5 Stages model for Online Service Index

	Model name	No of stage	Dimension
Benchmarking e-government: A global perspective 2001	The stages of e-government	5	Emerging, Enhanced, Interactive, Transactional, Seamless
UN Global e-Government Survey 2003	Web Presence Measurement Model	5	Emerging, Enhanced, Interactive, Transactional, Networked Presence
The UN Global e-Government Readiness Report 2004 – Towards access for opportunity	Stages of e-government evolution	5	Emerging, Enhanced, Interactive, Transactional, Networked presence
Global e-Government Readiness Report 2005 – From e-government to e-inclusion	Web Measure Model – Stages of e-government evolution	5	Emerging, Enhanced, Interactive, Transactional, Networked presence
UN e-Government Survey 2008 – from e-government to connected governance	Stages of e-government evolution	5	Emerging, Enhanced, Interactive, Transactional, Connected
Global e-Government Survey 2010 – Leveraging e-government at a time of financial and economic crisis	Stage of Online Service Development	4	Emerging Information Services, Enhanced Information Services, Transactional Services, Connected Services
E-Government Survey 2012 E-Government for the People	Stage of Online Service Development	4	Emerging Information Services, Enhanced Information Services, Transactional Services, Connected Services

Source: Developed for this research

The number of stages and boundaries of the stage of online service development in the Online Service Index was reduced from five to four stages in 2010. The content and boundaries of each stage were adjusted to cope with the evolving environment. The calculation has been adjusted accordingly (United Nations, 2010, 2012).

b) E-participation Index

In 2003, the concept of the e-Participation Index was proposed to measure the qualitative aspects of citizen participation in consultations and decision-making in a UN E-government Survey. The index is added to evaluate the quality and usefulness of information and services, and the willingness of the government to encourage the engagement of citizens in public policy made through e-government initiatives (United Nations, 2003, 2005, 2012).

The E-participation Index utilizes a qualitative approach to assess the willingness of government websites to provide information and services (United Nations, 2003), and include citizens in the political processes (United Nations, 2010). The Web Measure Index includes a quantitative assessment of e-participation. The E-participation Index is a qualitative measure by means of proxy; quality, relevancy, usefulness, and willingness (United Nations, 2003). The measurement framework comprises e-information, e-consultation and e-decision-making (United Nations, 2003, 2008). The evaluation of e-participation is less defined and studied compare with e-government service delivery but is no less important (United Nations, 2010).

Thailand and the UN E-government Survey

Thailand, as a UN member state, collaborated in the evaluation of an e-government development scheme in 2001(United Nations, 2001). In the 2003 Survey, member states were assessed and ranked in accordance with the E-government Readiness Index and the E-participation Index.

Thailand was in 56th position in 2003 followed by 50, 46, 64 and 76 in 2004, 2005, 2008 and 2010 consecutively. The rank of Thailand for the E-participation Index was 31 in 2003, 25 in 2004, 28 in 2005 and 41 in 2008 (United

Nations, 2003, 2004, 2005, 2008). However, the rank in 2010 fell to 110 and moved to 20 in 2012 (United Nations, 2010, 2012). The UN survey instrument was modified and more questions were included in 2010 (see Table 6).

Table 6 Ranking: Thailand in the UN E-government Development Index

Year	E-government Development Index	E-participation Index
2003	56	31
2004	50	25
2005	46	28
2008	64	41
2010	76	110
2012	92	20

Source: Developed for this research

The rankings of other member states has changed dramatically (United Nations, 2010, p. 86). The ranking system focuses on policy statements and technological development (Gauld, Goldfinch, & Horsburgh, 2010, p. 184). The evaluation of e-government initiatives in each country is prepared and presented by each member state. Improvements of service delivery have to be decided and made by each member state (United Nations, 2008, 2010, 2012).

The UN EGDI provides a snapshot of each member state. Even though the E-participation Index is added, evaluation is separate from the E-government Development Index. The UN continues to apply the E-government Development Index and the E-participation Index and in the EGDI (United Nations, 2010, 2012). Hence, there have been more researches which aimed to improve the UN measures.

For example, Jungwoo Lee (2010) reviewed an e-government stage model for the Online Service Index after 10 years of its application. The study indicated that the framework of each survey was fragmented and it was difficult to connect them to each other. Theoretical advancements were explored to link them to each other (J. Lee, 2010). Andrew Whitmore (2012) found several technical issues and suggested that statistical tools could be employed to guide the e-government development system (Whitmore, 2012). The basic model remains consistent but the meanings and values are changed from one survey to the next in accordance with the changes in e-government and the development of ICT.

2.4 Advantages and Disadvantages

Several evaluation methods are crafted especially for e-government and e-participation initiatives, though, measured separately. Each measurement method encompasses advantages and disadvantages (see Table 7).

Table 7 Advantages and disadvantages of the evaluation methods

Methods	Advantages	Disadvantages
Quantitative evaluation for e-government and e-participation initiatives		
Quantitative evaluation	- Application is easy (Marchand & Raymond, 2008). - Easy to understand for decision-makers (Marchand & Raymond, 2008).	- Site-centric approach (Miranda, et al., 2009). - Intra-organization usage (Marchand & Raymond, 2008). - Supply side focuses (Marchand & Raymond, 2008, Weinstein, 2009).
E-government initiatives		
Financial terms	- Application is easy (Marchand & Raymond, 2008). - Easy to understand for decision-makers (Marchand & Raymond, 2008).	- Intra-organization usage (Marchand & Raymond, 2008, Weinstein, 2009). - Difficult to evaluate intangible assets (Marchand & Raymond, 2008). - Supply side focuses (Marchand & Raymond, 2008).
Benchmarking	- Systematically identify best practices (Henry, 2001). - Comparable within the group of providers (United Nations, 2008, 2012).	- Supply side focuses (Marchand & Raymond, 2008; Rorissa, et al., 2011).
Citizen Satisfaction Model (CSM)	- Tailor for the EU context e.g. languages and cultures (Lee, et al., 2008).	- During development process, application is limited (Lee, et al., 2008). - EU member focus (Lee, et al., 2008).
Website Quality	- Objective measurement (Miranda, et al., 2009).	- Technology focuses (Lee, et al., 2008, Miranda, et al., 2009). - Supply side focuses (Marchand & Raymond, 2008, Weinstein, 2009).
Stage Model	- Easy to understand (Brown, 2007). - Explanation and prediction power (Brown, 2007). - Strategic direction of technology perspective (Brown, 2007). - Global benchmarking (United Nations, 2001, 2003, 2004, 2005, 2008, 2010, 2012).	- Strictly linear path progression (Brown, 2007). - Benefit realization is related to maturation (Brown, 2007). - Technology focuses (Brown, 2007). - Supply side focuses (Marchand & Raymond, 2008, Weinstein, 2009).
E-government Readiness Index (part of the UN E-government survey)	- Global benchmarking approach (United Nations, 2001, 2003, 2004, 2005, 2008, 2010, 2012).	- Snapshot or brief evaluation (United Nations, 2001, 2003, 2004, 2005, 2008, 2010, 2012). - Supply side focuses (Marchand & Raymond, 2008).
E-participation Initiatives		
E-participation Index (part of the UN E-government Survey)	- Global benchmarking approach (United Nations, 2001, 2003, 2004, 2005, 2008, 2010, 2012).	- Snapshot or brief evaluation (United Nations, 2001, 2003, 2004, 2005, 2008, 2010, 2012). - Supply side focuses (Marchand & Raymond, 2008).

Source: Developed for this research

Quantitative evaluation can be employed by both initiatives. Commercial software uses site-centric approaches to analyze the data in numerical forms, such as the number of visitors, the number of searches, and the most popular pages. Evaluations of visitor numbers and visitor behavior on the websites are easy and uncomplicated. The higher the number of visitors who browse the website, the better the opportunity is to increase revenue. Commercial software makes the application easy to apply, and the cost is not high (Miranda, et al., 2009). The numerical data are easily understood by owners and stakeholders (Marchand & Raymond, 2008). Analyzing the number of clicks or the hits or traffic of users may determine the effectiveness of websites. Effectiveness is measured from the ability of websites to attract more customers to fulfill an organization's goals. (Belanger & Hiller, 2006).

Financial measurement is an important feature used in accounting systems of organizations. The focus is on the supply side (Marchand & Raymond, 2008). In private sector, calculation of investment and the returns are basically available in the annual accounting preparation. Numerical statements are easy to read. If it is positive, it can support the reinvestment of the stakeholders. The calculation is created for an organization and operated within the organization for intra-organizational applications (Weinstein, 2009). However, the impact of ICT usage is considered an intangible asset and is very difficult to estimate in monetary terms (Marchand & Raymond, 2008).

Benchmarking is a renowned approach and is employed globally. It is mainly created by the providers of services aiming to compare themselves with the best in the industry and to learn how to improve the performance of organizations (Henry, 2001). The purpose of utilizing a benchmarking approach in e-government

and e-participation initiatives is to be able to compare among group members and gain knowledge from each other. Benchmarking was created by the business sector and has both political and economic impacts. The comparison has to be carefully interpreted. In the public sector, comparisons using a benchmarking approach are widely used and well-accepted, such as the United Nations (UN) E-government Survey, Accenture, Brown University, and the Economist (Brown, 2005). There is no agreed measurement standard, and the cost of evaluation is high (Bannister, 2007).

CSM, on the other hand, was built for regional applications in the European Union (EU). CSM was created with the collaboration of the EU, the private sector and academic institutions. The EU members are diverse and comprise different cultures and languages. The method is useful in a regional context for the reason that the characteristics and uniqueness of each EU member are taken into consideration. However, CSM is under the development process and the project was completed in the year 2011. CSM is an EU agenda and the focus is on EU members. The applications and practices are limited (H. Lee, et al., 2008).

Website quality measurement is built to measure website performance objectively. This method is widely applied in the business sector and gradually it has been adopted to assess government websites (Barnes & Vidgen, 2008; Miranda, et al., 2009). Even though users' opinions are measures, the focus is on the technical perspectives of the websites and the requirements of service providers (H. Lee, et al., 2008). User perspectives are less relevant (Marchand & Raymond, 2008).

Many studies have made use of the stage model to assess the development of government websites and e-government initiatives (Ancarani, 2005; M. M. Brown, 2007). The application of the model is not limited to the progression of government

websites, but also to e-participation initiatives especially in the UN E-government Survey (United Nations, 2003). Stage models have several advantages: they are *easy to use and understand, contain explanation and prediction power, encompass strategic directions of technological perspective* (M. M. Brown, 2007), and *apply in global benchmarking* (United Nations, 2010, 2012).

The stage model progresses in a step-by-step and straight-forward manner. Details of each stage are described. If the progress of websites reaches the final stage, benefits are to be fully gained. Practitioners are easily able to apply the stage model to assess the performance of any websites. The strength of the stage model is that it is easy and concise. It is practical to use a stage model to classify and predict the potential outcomes including performance and benefit gains. The model is a useful tool to explain the achievements of e-government activities and to provide insight into local government technological innovations (M. M. Brown, 2007; Siau & Long, 2005). Prediction is made simple.

A website at the beginning stage is simple and informative with mostly static information. More advanced services are added gradually in the later stages. For example,

> *Stage I* - Emerging: A government's online presence is mainly comprised of a web page and/or an official website; links to ministries or departments of education, health, social welfare, labor and finance may/may not exist. Much of the information is static and there is little interaction with citizens.
> *Stage II* - Enhanced: Governments provide more information on public policy and governance. They have created links to archived information that is easily accessible to citizens, as for instance, documents, forms, reports, laws and regulations, and newsletters.
> *Stage III* - Interactive: Governments deliver online services such as downloadable forms for tax payments and applications for license renewals. In addition, the beginnings of an interactive portal or website with services to enhance the convenience of citizens are evident.
> *Stage IV* - Transactional: Governments begin to transform themselves by introducing two-way interactions between 'citizen and government'. It includes

> options for paying taxes, applying for ID cards, birth certificates, passports and license renewals, as well as other similar G to C interactions, and allows the citizen to access these services online 24/7. All transactions are conducted online.
> *Stage V* - Connected: Governments transform themselves into a connected entity that responds to the needs of its citizens by developing an integrated back office infrastructure. This is the most sophisticated level of online e-government initiatives and is characterized by: (a) Horizontal connections (among government agencies), (b) Vertical connections (central and local government agencies), (c) Infrastructure connections (interoperability issues), (d) Connections between governments and citizens, and (e) 5. Connections among stakeholders (government, private sector, academic institutions, NGOs and civil society) (United Nations, 2008).

The progress of the e-government initiative through the stage model facilitates the strategic direction of the technological perspective. The level of interaction between users and online services has an impact on technology usage (Guo & Lu, 2008, p. 2143). In the beginning stage, IT requirement is simple in terms of information provision and one-way communication with users. When transactions are involved, advanced IT is expected with high security to protect the information of individuals. At the last stage, where government agencies are interconnected, back and front offices are linked, the most advanced IT is a necessity.

Some of the disadvantages are similar to others (see Table 7). Disadvantages can be grouped in accordance with similarities (see Table 8). The four groups are supply side focus, technology focus, and linkage of path progression and benefit realization, and do not support local contexts.

Table 8 Categorization of the disadvantages of the current measurement tools

Methods	Disadvantages
- Quantitative evaluation of e-government services and e-participation - Financial terms - Benchmarking - Website Quality - Stage Model - E-government Readiness Index (part of the UN E-government Survey) - E-participation Index (part of the UN E-government Survey)	**Supply side focus** - Intra-organization usage (Marchand & Raymond, 2008, Weinstein, 2009). - Difficult to evaluate intangible assets (Weinstein, 2009).
- Website Quality - Stage Model - Quantitative evaluation of e-government services and e-participation	**Technology focus** - Site-centric approach (Lee, et al., 2008, Miranda, et al., 2009). - Focus on strategic direction of technology perspective (Brown, 2007).
- Stage model - Citizen Satisfaction Model (CSM)	**Linkage of path progression and benefit realization** - Strictly linear path progression (Brown, 2007). - Benefit realization is linked to maturation (Brown, 2007).
- Benchmarking - Citizen Satisfaction Model (CSM) - E-government Readiness Index (part of the UN E-government Survey) - E-participation Index (part of the UN E-government Survey)	**Do not support local contexts** - Snapshot or brief evaluation (United Nations, 2001, 2003, 2004, 2005, 2008, 2010, 2012). - Comparable within groups (H. Lee, et al., 2008; Rocheleau, 2000; Rorissa, et al., 2011; United Nations, 2012)

Source: Developed for this research

a) Supply side focus

Measurement methods have been predominantly created by service providers. The focus of assessment lies on the supply side. The evaluations are related to organizational strategies and objectives. The results are used internally and presented to top management to guide decision-making and reinvestment (Marchand

& Raymond, 2008). Samples of evaluation methods that are created by service providers are financial terms, benchmarking, website quality, and stage models.

The impact of ICT usage is considered an intangible asset. Measuring an intangible asset is not possible using financial terms and quantitative evaluation even though numerical expression is understandable to decision-makers and stakeholders. Government has adopted evaluation schemes to assess its performances, and the results are used internally. The objectives of suppliers focus on the contentment of owners and stakeholders. The nature of financial terms is easy to understand. However, it does not offer an adequate picture of the organizational performance (Marchand & Raymond, 2008; Weinstein, 2009).

b) Technology focus

Samples of evaluation methods that focus on technology advancement are website quality, stage models, and quantitative evaluation such as visitor number. Most site-centric approaches are produced and employed by the service providers. Users only see "visitor number" on the first page of websites. The results are used internally for senior management and stakeholders in the decision-making processes (Marchand & Raymond, 2008; Weinstein, 2009). Users have limited or no chance to comment or give feedback in written statements for the improvement and adjustment of the websites.

For a stage model, the change from stage to stage requires technological advancement to offer and respond to the services requested (Ancarani, 2005; H. Lee, et al., 2008, p. 301). Technological sophistication and complexity are increased through the progress of each stage (Ancarani, 2005; Moon, 2002). These complexities have driven strategic directions towards technological advancement. The

technological focus is sometimes called a techno-centric view (Saxena, 2005, p. 503). Improvement and ICT usage are centered on technological development. Brown (2007) found that technological advancement does not appear to follow the hierarchical path of the stage model.

The development and expansion of ICT is evolving and dynamic and changes on a daily basis. The private sector is able to be closely followed and is willing to take a risk to invest in the latest technology (Miranda, et al., 2009). But government normally is not a leader in tapping newly developed technology and is unable to take any risk on behalf of its citizens. The evaluation should be able to reflect the users' feedback without any interference from technological advancement and development. Technological development and usage in any measurement model should be neutral (M. M. Brown, 2007).

c) Linkage of path progression and benefit realization

Samples of evaluation methods that link path progression with benefit realization are stage models and CSM (see Table 8). The progress of a stage model is in a step-wise and straightforward style. It is required to fulfill each stage before moving to a higher one. A leap of development can occur where government agencies are able to learn from each other and present their own websites. Website information and services could be started at any stage, not only from stage 1. The growth pattern then is a non-linear, sequential and hierarchical pattern (M. M. Brown, 2007).

Maturation is reached when all stages are completed. There is no rule about how long it takes to accomplish each stage and how long to reach maturity. The time to maturation of each website is not the same and cannot be calculated. It is not clear when the benefits are fully realized (M. M. Brown, 2007).

The growth of e-government development tends to increase slowly. Government services that are related to the political processes, such as voting and consultation, are normally in the later stages, and generally the last one. If a government website does not progress to the later stage, users will not be able to exercise their democratic activities. However, Brown (2007) found that the benefits are not necessarily related to maturation. Benefits are perceived to be appreciated when information and services are adopted at any stage.

d) Do not support local contexts

Samples of evaluation methods that are well-known at a global level are benchmarking and the UN E-government Survey, (see Table 8). Snapshots or comparison in brief is done with limited concern of national and local contexts. Only similar contents are compared within group members, while local contexts are ignored. The focus remains on the provider side, government (Marchand & Raymond, 2008; Weinstein, 2009).

The relationship between a government and its citizens is different from the private sector and its customers. Even though government information and services are delivered, like the private sector, through websites, the role of government towards its citizens is not the same. Adopting evaluation methods from the private sector does not portray or capture the uniqueness of government service delivery.

2.5 Roles of the Government and Citizens

The roles of government agencies and officials are tied to laws, rules and regulations. Their duties are more than just the delivery of information and services to citizens, as facilitation of the democratic process and environment are included in e-

government service delivery. Occasionally citizens are invited to participate in government activities, for example, the election of political representatives, consultation on government projects or by exercising the right to vote (Goldkuhl, 2008; United Nations, 2008). Government activities are uploaded on websites as an additional channel of service delivery. More choices are provided to encourage the democratic environment and the political processes (Stahl, 2005).

Representatives of government can be providers of certain services to citizens. There are two roles of public administrators: (a) to serve as a service provider and (b) to administrate in order to follow and maintain rules, regulations, and laws. Citizens are able to expect services from government and at the same time, citizens have their own duty to follow the law (Goldkuhl, 2008). In the decision-making processes, government makes decisions for what it is held accountable and on which its performance may be judged (Caddy, 2001).

2.5.1 Citizens and Customers

Stahl (2005) stated that citizens and customers are different identities with different characteristics and requirements (see Table 9).

In the private sector, online services are provided to customers with a common goal to increase the profits to its stakeholders. Organizations aim to gain more customers who are loyal to its products and services. Customers who often purchase its products and services are categorized as loyal customers (Marchand & Raymond, 2008; Weinstein, 2009). They are considered valuable to organizations. In the public sector, government services are offered to all citizens whether they are good citizens with no criminal records or if they are imprisoned in jail. Government is unable to choose or discriminate against any citizens. When the government includes

IT in its administrative work, citizens demand round-the-clock services with user-friendly designs, modified to individual needs (United Nations, 2008).

Table 9 Comparison of the characteristics of customers and citizens

Customers	Citizens
• Geared towards loyal customers	• Remain citizens no matter how they behave
• More choices of suppliers	• Limited choices
• No power over customers	• State has a huge amount of power over the citizens.
• Customers and suppliers or organizations are separate identities.	• State and citizens depend on each other.

Source: Developed for this research

Customers are able to choose the best suppliers available to them. A supplier that offers the best deal is likely to win the customer. Customers have more influence on their suppliers. A government agency, however, is the only choice for a particular government service. For example, to obtain or renew a driver license, citizens have to consult the Department of Motor Vehicles. Other government agencies cannot issue a driver license. Government has more control over its citizens in terms of information and services.

An organization that can satisfy its customers tends to be successful and generate more revenue and profits. Customers and suppliers are separate identities. They are linked together because of the products and services offered. However, they are separate identities. But the relationship between citizens and their government is tied by laws, rules, regulations, and obligations to each other. Government cannot

exist without citizens and there are no citizens without the existence of government. They are inseparable.

Citizens' requirements and priorities are placed at the center of government strategy. Citizens are able to have their say through government websites including voting and expressing their opinions. Citizens can assist in defining and shaping the quality of government services as well as their expectations (Aksararak & Pornwasin, 2004; Office of the Public Sector Development Commission, 2003).

2.5.2 Citizen roles

Goldkuhl (2008) stated that there are four roles of citizens which are as follows:

a. Citizens-as-voters: Citizens are required to exercise their citizenship through elections and other related types of involvement. Traditionally, citizens have to travel to the designated locations or government offices to vote. With ICT enabled services, information such as candidate profiles and schedules are announced online. Policies of each candidate can be viewed on websites. Citizens are able to cast their votes online through the websites of government agencies.

b. Citizens-as-influencers: Citizens are able to input their values, ideas and opinions on government works and projects. Government agencies can solicit expertise and judgment from citizens and the business sector, such as consultation from the beginning of a government project towards implementation and evaluation. Usually letters of invitation and announcement are made to the public, and then citizens attend public consultation sessions to

contribute their ideas about government projects. Citizens can participate in any consultation online from anywhere at a convenient time through websites.

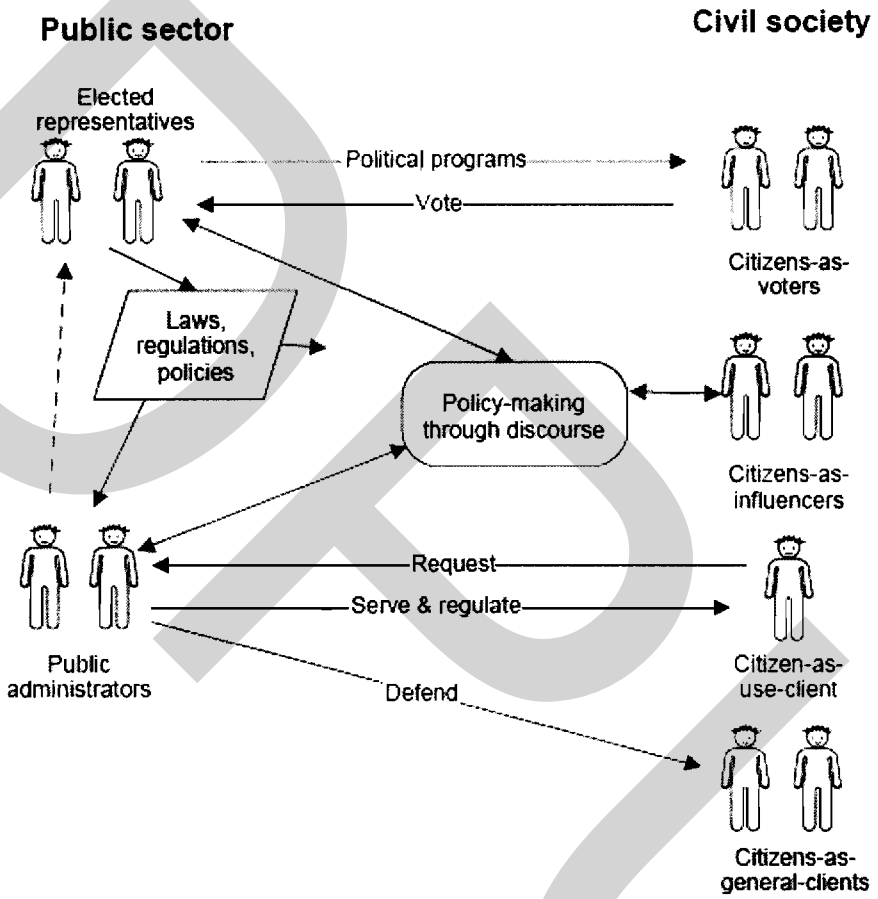

Figure 2 The citizen's roles in relation to civil society and the public sector

Source: Göran Goldkuhl (2008)

c. Citizens-as-use-client: Citizens who require services from public administrators use this type of service which is performed in relation to the responsibility of each government agency. For example, the duties of the Ministry of Public Health are related to medical care, nursing colleges, prevention of

communicable diseases, the regulation of drugs and medicine, and traditional medicine, etc. Citizens can request services at specific agencies. If a citizen is ill, diagnosis can be made and treatment can be given at a hospital or a community clinic. If a citizen requires a new driver's license, he or she has to go to the Department of Land Transport.

d. Citizens-as-general-clients: This includes citizens who might be affected by the decisions of public administrators, such as drunk drivers. All drivers have to obtain a driving license from the Department of Land Transport. Once an accident occurs, a number of government agencies are involved. For instance, injured persons are sent to hospital and the driver has to deal with the Royal Thai Police, etc.

The role of citizens is to expect services from government ranging from information provision and transactional and non-transactional services to decision-making, consultation and voting. Citizens are being served and regulated by the government. The direct role of citizens is in using government services and applications. The decisions made by administrators may indirectly affect the general public or an individual citizen. The indirect role of citizens is to participate in policy making with their government. As defenders, citizens have to protect their interests and face the consequences of the decisions made by public administrators (Goldkuhl, 2008).

In the view of decision makers, citizens provide inputs and opinions for the decision-making processes of the government and its administrative works (Caddy, 2001). Citizens' feedback can be used as guidelines to modify the strategic objectives and government services to fit citizens' requests (Office of the Public Sector

Development Commission, 2003). Citizen inputs and opinions can help government agencies (a) to understand public needs, (b) to develop, communicate and distribute public services, and (c) to assess the degree of satisfaction with the services (as cited in Vigoda 2002).

The roles of citizens and government are interconnected. Citizens are able to explore a website not only for information and services, but also to input their ideas, share their experiences, join political discussion groups, sign up for online campaigning, or chat with government officials. The measurement of their feedback is very important for government to adjust the services delivered and provide what is considered essential for citizens.

2.6 Summary

Traditional evaluation methods are no longer suitable for the e-government environment. They are either based on off-line services or adapted from the business sector, such as financial calculations, benchmarking, and measurement of website quality. Each tool has its disadvantages when applied to assess e-government service delivery. These disadvantages are categorized into four groups; the supply side focus, the technology focus, the linkage of path progression and benefit realization, and do not support local contexts.

Roles of government and its citizens are different from business providers and their customers. Government has to take citizens' needs into consideration in providing government services, and enables citizen participation in the political processes. Government cannot survive without citizens.

E-government and e-participation initiatives share some similarities;

a) Information and services are offered via the same government websites.

A website is considered a gateway to reach individuals and groups of citizens. Government information and services are presented online. Communication via websites can be either one-way or two-way communication, for instance, calendars of events, announcements, news, profiles of government agencies, campaigns for elections, eliciting citizen opinions on government projects, FAQ (Frequently Asked Questions), quick polls (web-based instant survey), online newsletters, and search engines (web applications that support users to find and retrieve information using keyword searching). Citizens and government officials are able to interact and respond to citizen inquires anytime.

b) Users are citizens.

The focus of e-government service delivery is citizens. Government has an obligation to serve and rule its citizens. Citizens have duties and responsibilities as citizens of a country (Office of the Public Sector Development Commission, 2003; Sæbø, et al., 2008). Government cannot exist without citizens (Stahl, 2005). They are inseparable.

Even though e-government and e-participation initiatives share several similarities, the evaluations of both initiatives are executed separately. Adopting evaluation methods from the private sector does not capture the characteristics and obligations of the government to its citizens.

Evaluation methods that are applied at a global level offer part of the e-government assessment for global comparisons. Modifications for each country have to be made in accordance with local preferences by the government. Measuring feedback in local terms enables governments to present the desire services to the

public. The ability to deliver government information and services through the same websites makes it possible to assess information, services, and citizen participation at the same time. A new measurement tool is called for.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The research question "What is the assessment model for e-government service delivery that accommodates user needs in a Thai context?" is in a quest for two answers; to identify a framework and to find an evaluation tool to better assess e-government service delivery. The complicated quest requires more than just one approach to search for proper answers and to increase the quality of research (Gorman & Clayton, 2005; Lewis, et al., 2005).

Measurement is a fundamental activity in scientific research including behavioral and social sciences. Scale development is applied to discover a measurement instrument. Theory then plays the vital role in identifying and creating measurement constructs and validating measurement scales (DeVillis, 2003).

Prior to the scale development methodology, a survey of the current websites of Thai government agencies is examined. The percentage of surveys presented on the government websites is observed. Chapter 3 includes the research design, the scale development for the IS research field, the research procedures, data collection, and data analysis.

3.2 Research Design

A mixed method research design is a combination of quantitative and qualitative approaches in order to investigate and study complex research problems.

The combination allows researchers to evaluate trends, prevalence, and outcomes while at the same time examining meaning, context, and process. Using both approaches provides a better understanding of research problems than using just one approach. The weakness of qualitative and quantitative approaches is offset when using a combination of these approaches (Cameron, 2009; Creswell & Clark, 2007).

This study is in search of a guiding framework and an instrument. It is an exploration in nature. A mixed method design for instrument development is appropriate to apply to identify a measurement instrument for e-government service delivery. It is called the Exploratory Design Model. See the visual diagram of the Exploratory Design Model in Figure 3 (DeVillis, 2003).

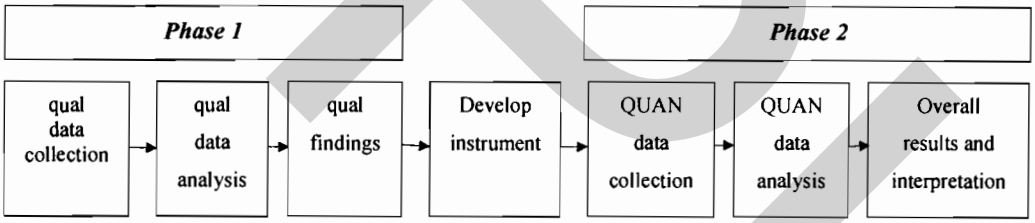

Figure 3 Visual diagram of the Exploratory Design Model

Source: Robert F DeVillis (2003)

A qualitative approach is employed in the first phase in order to determine an evaluation framework, a dimension, a list of items, and the definition of each item. Dimensions, item stems and statement items are explored, selected and examined with pre-specified samples. The draft measurement instrument is then explored in the later phase. The instrument is tested and validated in phase 2 using specified samples and environment (Cameron, 2009; Creswell & Clark, 2007; DeVillis, 2003).

"Scale" is a measurement tool which assesses variables that are not directly observed. This type of variable is called a "latent variable". Latent variables are composed from a theory or theoretical framework which is linked to the phenomena of interest. A measure is the representative of a latent variable. A measure consists of collections of items combined into a composite score, see Figure 4 (DeVillis, 2003).

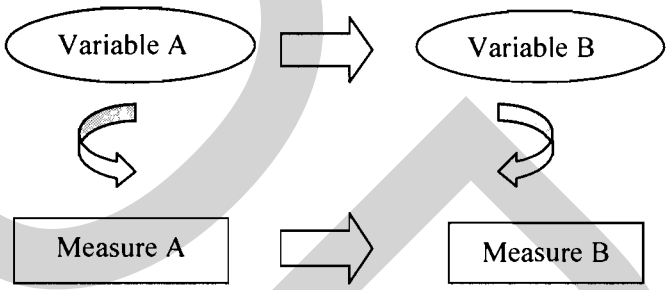

Figure 4 Relationship between latent variables and measures

Source: Robert F DeVillis (2003)

The relationship between measures and latent variables is explored and eventually revealed the meaning of latent variables. If a phenomenon of interest is complex, one item may not be able to capture the fundamental measure. Multiple item scales might be an alternative assessment (DeVillis, 2003).

This research study is looking for a measurement instrument which takes e-government service delivery into consideration. Government services are offered through the websites of government agencies. Government services have to be created by governments, used of system by citizens, and then citizens' needs can be fulfilled. It has an information system (IS) characteristic. The evaluation tool of e-government service delivery should be systematically generated in order to assess the IS setting

and e-government environment. This research study includes the assessment of citizen participation, an important element of government services.

The development and measurement of constructs was originally created by Gilbert A. Churchill in 1979 to contribute to the improvement of measures in marketing variables. A framework and procedure are generated with desirable reliability and validity. The process consists of a sequence of steps; specify the domain of the construct, generate samples of items, collect data, purify the measures, assess reliability with new data, assess construct validity and develop norms. It is applicable to multi-item measures (Churchill, 1979; Creswell & Clark, 2007).

The measurement of constructs, created by Churchill in 1979, has been employed in other disciplines and industries such as operations management and Information Systems research (Lewis, et al., 2005); strategic planning (Sethi & King, 1991), and the winery industry (Wickramasekera, 2006). Some researchers used this procedure as an initial framework and tailored it to match their research fields. Other researchers added more reliability and validity in order to increase the quality of research (Gerbing & Anderson, 1988; Lewis, et al., 2005; Peter, 1981).

Construct Development Methodology is a scale development procedure for MIS research developed by Bruce R. Lewis, Gary F. Templeton, and Terry Anthony Byrd in 2005. The methodology shows how to adequately obtain a domain definition and initially build a measure based on its domain definition within an IS environment. The item stems are screened, selected and validated through a procedure using a mixed method approach (Lewis, et al., 2005). The result is a validated instrument which can be further utilized as a starting point of the practical use in government agencies. This methodology can facilitate the quest for a framework and a

measurement instrument for e-government service delivery in a Thai context. Construct Development Methodology is chosen for this research study.

3.3 Research procedure

Construct Development Methodology consists of 3 stages; Domain, Instrument and Measurement Properties, see Figure 5 (Lewis, et al., 2005).

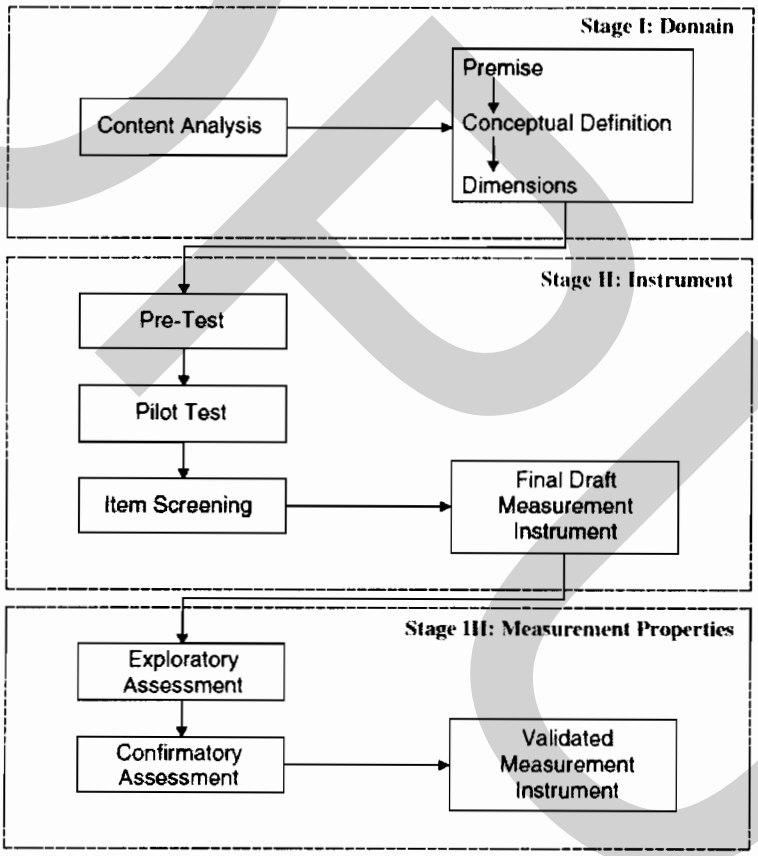

Figure 5 Construct Development Methodology

Source: Bruce R Lewis, Gary F Templeton, and Terry Anthony Byrd (2005)

3.3.1 Domain of the constructs

The first stage involves the development of a domain definition, item stems and statement items. Domain definition is a general guide to what an instrument is determined to evaluate. Content analysis is applied in order to develop a construct from the main idea and draw inferences from text. Three items of information are discovered for the construct: purpose, theoretical description and the list of dimensions (Lewis, et al., 2005).

Content analysis is a technique for gathering and analyzing the content of text. Text is a medium of communication in a written, visual or spoken form. Content is compared across many texts and uncovers the aspects that are difficult to see (Neuman, 2006). Trends and patterns in documents can also be detected. Several methods can be utilized to analyze the content of text, for instance literature review, interview transcripts and case studies (Lewis, et al., 2005), existing philosophies, personal surveys and focus groups (Neuman, 2006).

The steps to define the domain definition comprise:

3.3.1.1 A premise to specify the importance of constructs: The construct is conceptualized from the domain of the idea. What is included and not included in the constructs is stipulated.

3.3.1.2 A conceptual definition is used to describe the construct in theoretical terms: A domain idea is defined together with its meaning.

3.3.1.3 A list of dimensions to represent the elements of constructs including the item stems of each dimension and its statement item.

3.3.2 Instrument

The second stage engages in producing and improving a measurement instrument through multiple iterations. The domain of constructs from stage 1 will be purified through 3 techniques as follows:

3.3.2.1 A pre-test to find empirical feedback and evaluate the appropriateness of the instrument: early consultation with academia and experts helps the design of philosophical elements to be a more scientific progress and increase the efficiency of construct development (Lewis, et al., 2005). The use of experts, academics and government officials helps to determine the important issues including identifying item stems and statement items (Creswell & Clark, 2007). The unit of analysis with knowledge about e-government is invited to critique the questionnaire and related matters. Suggestions for adjustment and improvement are made for the initial instrument design such as format, content, understandability, terminology and ease and speed of completion (Lewis, et al., 2005).

3.3.2.2 A pilot test with small and pre-defined samples to check the difficulty of answering questionnaire: a questionnaire is drafted using suggestions from experts in a pre-test. The questionnaire is presented in both Thai and English. The search includes the wording, length and design of the questionnaire, the difficulty in answering the questions, the time, and the selection of preferred language etc.

3.3.2.3 Item screening to review and finalize the instrument: a list of item stems and the revised questionnaire is reviewed by experts, academics and government officials. The feedback and suggestions from experts and academics have facilitated (1) the improvement of the questionnaire, (2) the removal of ambiguity, (3) the elimination of duplication and unnecessary indicators, and (4) the agreement by

experts that the instrument has content validity (Cheng & Choy, 2007). The questionnaire is adjusted and applied in Stage III.

3.3.3 Measurement properties

Large scale data are collected from pre-specified samples, the users of government website. The self-administered online survey is created and added to a recruitment email. The email is sent to emails in databases and social networks.

A Likert-scale type is applied to measure the level of satisfaction of online users in the business sector (Anand, 2007; Churchill, 1979; Parasuraman & Zeithaml, 2005). The scale ranges from one to five or nine depending on the context of the research studies (Noar, 2003; Panopoulou, et al., 2008; Wangpipatwong, et al., 2008). A Likert-scale type is applied in measurement instruments for e-government initiatives (Wangpipatwong, et al., 2008).

In a pilot study, exploratory factor analysis (EFA) is applied to review and retain only the item stems that are relevant and correlated to the dimensions in the D&M IS Success Model (Cheng & Choy, 2007). The final set of items is signified as a priori measurement model of the construct under investigation. The revised instrument is then used and data are collected from a new set of pre-specified samples. The obtained data are examined in terms of the response rate, statistical power and non-response bias (Lewis, et al., 2005).

A two-step approach is recommended for reliability and validity analysis, and hypothesis testing: Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM). CFA is applied to assess the efficacy of measurement among items including internal consistency and validity. After that, SEM is employed to evaluate

the relationship of constructs with its associated network of theoretical concepts (Anderson & Gerbing, 1988).

CFA is an evaluation of a pre-specified relationship using a multivariate technique. SEM is an estimation technique that provides assessment of series of separate multiple regression equations performed simultaneously. The basic components are the measurement model and the structural model. In the measurement model, each scale item is evaluated if it contributes to variable (s) and if scale items measure the concept of interests. Dependence relationships of dependent and independent variables in the concept are assessed using combing aspects of multiple regression (Hair, Anderson, Tatham, & Black, 1998; Hair, Bush, & Ortinau, 2003).

The critical goal of instrument development is to obtain an acceptable level of construct validity. Construct Validity is advised for instrument development (DeVillis, 2003) and is important at the operational level (Straub & Carison, 1989). Construct validity is the extent to which a measure assesses the construct it is intended to assess. Validation of a construct is "the vertical correspondence between a construct which is at an unobservable, conceptual level and a purported measure of it which is at the operational level (Brahma, 2009; Peter, 1981).

Bruce R Lewis, Gary F Templeton, and Terry Anthony Byrd (2005) defined construct validity as the extent to which a set of measures with an operational definition of construct appropriately reflects the theoretical concept of interest. Reliability and validity analyses are applied from stage I to stage III. Some values of reliability and validity can be computed using a software package and some are accumulated through the development processes.

Assessment of construct validity is an essential tool and is applied to enhance the instrument development process to determine the reliability and validity of measurement scales and instruments (Brahma, 2009). The evaluation of validity comprises the assessment of reliability, content validity, convergent validity, discriminant validity, and nomological validity (Lewis, et al., 2005).

Content validity derives from two parts; the first one is logically built up in stage I and the second part is statistically computed in stage II (Tojib & Sugianto, 2006). Reliability, convergent validity, discriminant validity, and nomological validity derive from statistically computation of data in stage III (Lewis, et al., 2005).

3.4 Data Collection

The main study involves a large data collection. The pre-specified samples are users who connect and communicate with the Thai government via the websites of government agencies. Given the study involved Thai government websites, a web-based survey was utilized as the means for data collection. The instrument was prepared as an online questionnaire and a hyperlink was added to recruitment emails. Answers are automatically collected once a respondent submits the questionnaire through the online system. All data are transferred to an excel file at the end of collection period.

The study sought to send recruitment emails to several databases of academic staff and students in the university. Contacts in social networks and alumni networks were invited to complete the online survey. Invitations were extended to the business sector such as financial and IT related companies. Telephone calls were made in advance to ask for permission and request to contact members of staff.

Invitation emails were sent to contacts and distributed to samples within the organization.

3.5 Unit of analysis

The purpose of this research study is to develop a measurement instrument to evaluate the level of satisfaction of users. In the instrument development process, a draft instrument in an online questionnaire form is sent to users inviting them to voluntarily answer the questions. The unit of analysis is an individual user who accesses Thai government services through Thai government websites. Users are those who connect and interact with their government via Thai government websites. There is no limitation of location as long as users have access and fill in the questionnaire.

3.6 Examination of Thai government websites

The aim of this investigation is to examine the current surveys available on websites of Thai government agencies. Websites in ministerial and departmental levels are explored as to whether there is an online survey soliciting users' opinions and to what extend government agencies require feedback from online users. There are 20 ministries with 153 departments, 57 state enterprises, 14 public limited companies and 36 non-government organizations (under ministry supervision).

Online survey in this study means a questionnaire posted on government websites asking online users about their opinions on government services. Questions in a survey should include information about respondents or online users, the quality of services, the level of satisfaction and the impact of value for money. Other

communication tools such as web board, suggestion box, guest book, submission of complain, poll, voting, hotline, and social networks are investigated as other options for online users.

3.6.1 Examination procedure

The websites of 20 ministries were examined together with two of their departmental websites. Two departments of each ministry were randomly selected using the 'Data Analysis' feature in Excel Microsoft Office 2007. All department names were put in an Excel sheet and a number was assigned. Data analysis was employed to randomly choose the name. The first two names were selected and their websites were investigated. If the selected websites did not operate properly for any reason, the next one was chosen.

A total of 60 websites were investigated between 1and15 October 2010 (see Appendix A, List of Thai Government Websites). Examination was carried out 5 times, checking the same websites, during the fifteen days. The survey was searched and the features of the questions were checked. The features were observed using the requirements in the Royal Decree on Criteria and Procedures for Good Governance (2003) information of respondents, quality of services, pleasure of customers (level of satisfaction) and the impact of value of money (Office of the Public Sector Development Commission, 2003).

3.6.2 Results

- 45 of 60 websites do not provide online survey (75%). 15 websites offer online survey. The survey of three websites could not be accessed. It appeared as an 'Error' page. Of fifteen websites, four websites are at ministerial level, eleven are of departmental level.

- The surveys of twelve websites were presented on the first page as a web banner. Users must click on the banner to access the questionnaire and fill in the survey with their free will. The scale ranged from 3 to 5, highly satisfied to dissatisfied. 11 of 12 surveys asked about respondent information such as gender, age, education and career. Generally, information of respondents appears in the first section, followed by questions and suggestions in a written statement. Questions contain choices of answers or numbers for rating. When users complete the survey, user can use the "submit" button to send the survey to the relevant government agency.
- Questions relating to the level of satisfaction requested citizen inputs about the design, information, system, usage, repeat usage and benefits. Usage was focused on how often a user visited the website and at what time of the day. The benefits were mostly concerned with the information acquired. Only one survey asked if users were interested in quality of service. None asked if websites allowed government to save operating costs.

Only 25% of the Thai government websites provided an online survey through a web banner even though the assessment of government service delivery is stated in the Royal Decree and Plans. Most of the surveys asked for information about the respondents and the level of satisfaction and focused on the design of the websites to be used as a guide for improvements. Only a few questions are related to the quality of services and the impact on value of money. Questions and scales in each survey are varied in terms of number and questions asked. There is no reference as to whether the survey is complied with any policy or strategy. The evaluation of citizen participation is not included.

3.7 Summary

The results from the examination of Thai government websites support the need to search for a measurement framework and an instrument to assess e-government service delivery in a Thai context. The development of a framework for IS evaluation, a scale and a measurement tool require an explicit research methodology. Prior to executing the selected methodology, an examination of current websites is needed to observe how government agencies evaluate the performance of their websites. Alternative channels of communication and interaction with citizens are also investigated.

Providing e-government service delivery includes IS characteristics, Construct Development Methodology, a scale development for IS research, is applied to explore a framework and instrument. The methodology is a two-step approach. The first step allows researcher to identify a research framework and model within e-government setting. The research model is applied to compose a measurement instrument and validated in the second stage.

CHAPTER 4

INSTRUMENT DEVELOPMENT AND RESULTS

4.1 Introduction

The investigation of Thai government websites has revealed the necessity to explore a framework and measurement instrument for e-government service delivery (See Chapter 3, 3.6). The current online surveys are not systematically built for Thai government websites. Each website has its own systems to collect feedback from users. The investigation confirms the essence of an evaluation tool for e-government services delivery. An alternative instrument is justified to extend the scope of measurement from government information services to citizen participation. The research design and methods should support the exploration of a framework and a measurement tool for the success of IS.

A theoretical framework is constructed from a systematically composed research procedure for an IS environment (Lewis, et al., 2005). Theory has played an important role in the scale development and validation of the instrument. Theory and the nature of the construct are used to specify empirical relationships and determine whether empirical results support or invalidate a measure (DeVillis, 2003; Peter, 1981).

The D&M IS Success Model 2003 is selected as an initial framework for e-government service delivery. The extension of the model incorporating the "Participation Quality" dimension brings the roles and responsibilities of citizens together with the obligations of government agencies to follow and support the

political processes. The core elements of public administration are not only information and services, but also include the participation of citizens in a democratic environment. The nature of ICT and the unique characteristics of the internet make it possible to include democratic principles in the measures (Iversen, Vedel, & Werle, 2004; Stahl, 2005).

Statistical analysis software, the Statistics Package for Social Science (SPSS), was employed to determine the reliability and validity of the instrument. Structural equation modeling (SEM) was also used to further validate the results from the SPSS add-on Analysis of Moment Structure (AMOS) for structural equation modeling and testing the relationship between constructs.

Chapter 4 elaborates the selection of an evaluation framework, instrument development and hypothesis testing following Construct Development Methodology. A research model is chosen based on IS theory. Dimensions and measures are searched and employed to compose a draft measurement instrument. Data are collected through online survey and the results are interpreted. Reliability and validity analyses are carried out in accordance with construct development methodology. Content validity is achieved in stage I and II. Reliability and construct validity is derived from the computation of data in stage III. The result of confirmatory factor analysis (CFA) is presented using the AMOS program. Lastly, the results of the structural equation modeling (SEM) and hypothesis testing are displayed.

4.2 Domain idea and definitions

The domain idea is developed in order to find a construct to assess e-government service delivery in stage I. Content analysis is applied to search for a

framework, a list of dimensions, item stems, and item statements (Lewis, et al., 2005). Content validity is the first validity type to be determined in an instrument development process. Content validity is the degree to which elements in an instrument are relevant to a construct within an assessment purpose. It is obtained logically through the application of the content analysis method in stage I and is statistically calculated in stage II (Tojib & Sugianto, 2006).

The evaluation of e-government service delivery is complicated. The nature of e-government is a cross-disciplinary research. The study involves more than just one research area to better understand the characteristics of e-government service delivery, such as political science, sociology, and public administration (Sæbø, et al., 2008).

The library of Dhurakij Pundit University provides an online database of international subscriptions; for instance, ABI/INFORM Global, and Science Direct. Government documents are searched and downloaded from websites of various government departments and international organizations such as the National Electronics and Computer Technology Center (www.nectec.or.th), the Office of the Public Sector Development Commission Thailand and the Office of Civil Service Commission. Samples of reports of international organizations are downloadable from websites of the United Nations Public Administration Network (www.unpan.org), European Union (http://ec.europa.eu/), and the International Telecommunication Union (http://www.itu.int). Keywords are e-government and e-participation related topics including measurement models and the evaluation of government websites.

Government services are offered online through websites. Information and services are available 24 hours per day and 7 days per week (24/7) and can be

accessed from anywhere at any time (Aksararak & Pornwasin, 2004; National Information Technology Committee Secretariat, 2003). The environments of information and service provision and acquisition have changed (M. M. Brown, 2007; DeLone & McLean, 2003). The demands of users have adjusted with the use of the World Wide Web technology (Heeks, 2006; Office of the Public Sector Development Commission, 2003; United Nations, 2008).

When government applies ICT to public administration, websites are created as a channel for government to interact with its citizens. The process of e-government services starts from the production of information and services which is uploaded to government websites and consumed by users. There are also impacts after using the websites. Users see only web pages, but the preparation and implementation processes are complicated. The entire IS system is employed to offer government information and services. Evaluations of websites involve more than the number of visitors and the pages they click. The traditional evaluation methods are no longer comprehensive enough to assess e-government service delivery.

E-government service delivery possesses IS characteristics and requires IS measures for assessment. The study requires knowledge in IS related fields, for instance, information technology management and computer science (Marchand & Raymond, 2008). There are opportunities to apply IS theories and methodology in public administration. Measurement of IS practices is a scheme which can be applied to evaluate government websites.

4.2.1 Evaluation of Information System

An Information System (IS) can be defined as a collection of IT, procedures and people responsible for the capture, movement, management and

distribution of data and information (Martin, Brown, DeHayes, Hoffer, & Perkins, 2005). Even though IT was first applied in accounting to increase the efficiency of an organization, it has been implemented and developed rapidly and influenced the whole organization (Martin, et al., 2005; Pearlson & Saunders, 2006).

Evaluation of performance has been used and developed continuously. In the 1980s, the focus was on internal financial and operational execution. It was result-oriented with short-term value. In the 1990s, performance was defined in relation to strategic objectives and stakeholders' expectations. More aspects were included; for instance, manufacturing strategy, and financial and managerial performance. Later in 2000 and after, the evolution of ICT and web-based technology has brought the evaluation of organizational performance into a different era. ICT facilitates a move from simple evaluation to more extensive and customized evaluation for decision-making within an organization. The entire system of IT and the opinions of actual users are taken into account to measure the success of organizational performance in the private and public sectors. Measurement is balanced between quantitative and qualitative methods, internal and external factors, results and determination, and short-term and long-term values (Marchand & Raymond, 2008).

Two of the widely-used IS measurement approaches in e-government environment are Technology Adoption and Information System Success.

a) Technology Adoption

Technology adoption is involved in individual behavior and attitudes towards the use of technology. Individual behavior can be predicted from beliefs and attitudes. The focus is on the dynamic human interaction and decision-making system. Samples of the technology adoption models are the Theory of Reasoned Action

(TRA) (Fishbein and Ajzen, 1975) and the Technology Acceptance Model (TAM) (Davis, 1989; Gilbert, Balestrini, & Littleboy, 2004). The renowned method is TAM.

TAM was created by Fred D. Davis in 1989 with the purpose of determining the acceptance level of users of IS in an organization. TAM aims to be applied as a prediction measure for users and to find out their demands. It was intended to be more practical for managerial level and vendors / service providers (Davis, 1989). TAM was crafted based on the Theory of Reason Action which concerns the determination of intended behavior. TAM consists of two primary constructs; perceived usefulness and perceived ease of use. The process of using begins with beliefs that influence attitudes and then cause behaviors. The acceptance of users is a pre-condition for the intention-to-use, usage and benefits can be realized (Carter, 2008). Figure 6 shows TAM that was developed and adjusted by Venkatesh and Davis in 2000 (Venkatesh & Davis, 2000).

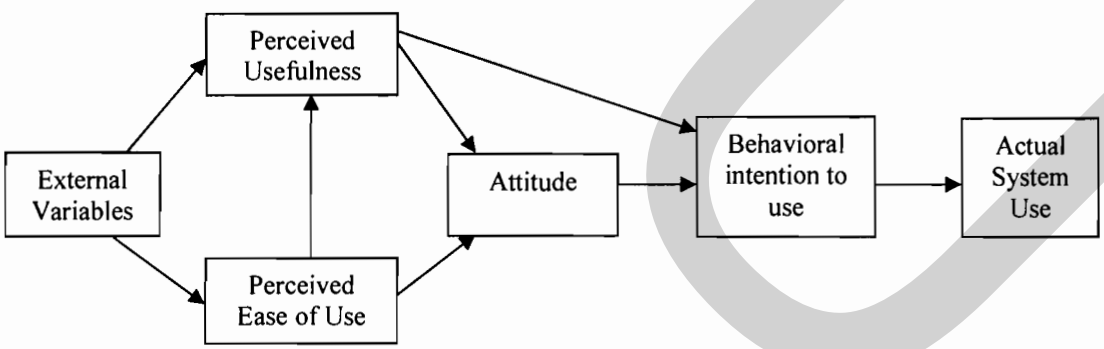

Figure 6 Technology Acceptance Model (TAM)

Source: Venkatesh and Davis (2000)

TAM has been applied, adopted and extended in many research fields such as wireless internet technology (Lu, Yu, Liu, & Yao, 2003), knowledge management (Money & Turner, 2004) and online shopping (Al-adawi, Yousafzai, & Pallister, 2005; Gefen, Karahanna, & Straub, 2003) including e-government usage (Al-adawi, et al., 2005; Carter, 2008; Carter & Belanger, 2005).

The two main constructs, perceived usefulness and perceived ease of use, are practical to evaluate the intention of users towards technology usage in order to reach and retain more users (Carter, 2008). Constructs are added, rearranged or deleted from the original model in order to be appropriate for each measurement and industry (Barnett, Kellermanns, Pearson, & Pearson, 2006/2007; Venkatesh & Davis, 2000; Wixom & Todd, 2005).

TAM is employed to assess e-government initiatives in various perspectives. Sinawong Sang, Jeong-Dong Lee, and Jongsu Lee (2009) employed TAM at a national level and studied the viewpoint of public officers in 12 ministries in Cambodia. It was the first e-government research in the country and identified the level of adoption of public officers (Sang, et al., 2009). Vichita Vanthanophas, Nattapon Krittayaphongphun, and Chalalai Klomsiri (2008) employed technology acceptance to assess an e-government initiative in the Royal Thai Navy. The factors that influenced the acceptance were prior experience, job relevance, commitment, and trust (Vanthanophas, krittayaphongphun, & Klomsiri, 2008). Government has tried to predict the online behavior of citizens and the degree to which they keep using online services. Prediction power is valuable to government (Carter, 2008; Lean, Zailani, Ramayah, & Fernando, 2009).

Technology adoption is concentrated at an individual level (Burton-Jones & Hubona, 2005; Petter, DeLone, & McLean, 2008) and researchers have focused on individual impacts and benefits (Petter, et al., 2008). Individual intentions and acceptance may lead to repeated use and purchase of products and services and bring more profits to the business sector. Even though a customer-centric approach is applied, the aim of the TAM application is to focus on the individual level of technology adoption. The core model, as a theory, does not provide a systematic means of expanding and adapting to be more useful and evolve in IT contexts (Benbasat & Barki, 2007, p. 212).

Acceptance is not equivalent to success; it is a pre-condition of success in IS (Petter, et al., 2008). The application of TAM in IS research is limited to IT adoption. The investigation of the full range of the consequences of IT adoption is not included (Benbasat & Barki, 2007; Petter, et al., 2008).

b) Information System Success

Measurement of success is, in general, related to the measurement of performance and can be interpreted using different methods. The traditional evaluation of performance normally measures inputs (what was done and how much was invested) and output (what is achieved) (M. M. Brown, 2007). Stakeholders and management are pleased about positive returns and reinvestment is made afterwards.

The success of an IS department requires the evaluation of IS practices, policies and procedures with IS success measures (DeLone & McLean, 1992). The Information System Success Model (IS Success Model) is used to assess IS effectiveness and value, and the implementation and use of IT.

In the early stage of e-government development, IT is applied to administrative work in order to increase efficiency and lower the cost of government service delivery. Back-end office systems can be attuned and IT can be utilized to enhance service delivery system. After that, as the Internet and website technology developed, it is possible to facilitate the linkage of back office and front office systems. The integration of the administration, services and government agencies has increased the efficacy of government services and availability 24/7 through government websites and internet connection (United Nations, 2008, p. 3).

The DeLone & McLean IS Success Model (D&M IS Success Model) is one of the most popular success models widely applied in the IS research field (DeLone & McLean, 2003; Gable, Sedera, & Chan, 2008; Petter, et al., 2008; Petter & McLean, 2009; Scott, DeLone, & Golden, 2009). The application to evaluate e-government services has increased in the recent years (Floropoulos, Spathis, Halvatzis, & Tsipouridou, 2010; Hussein, et al., 2007; Prybutok, Zhang, & Ryan, 2008; Wangpipatwong, et al., 2005).

The TAM and D&M IS Success Models concentrate on different levels. TAM focuses on the taking up at an individual level. If users realize the usefulness and understand the ease of use, it leads to usage continuation (Davis, 1989; Lu, et al., 2003). Adoption is considered a part of an information system, but not the complete service delivery process. D&M IS Success Model, on the other hand, reflects the whole process from production, consumption to realization of impacts (DeLone & McLean, 2003; Petter, et al., 2008).

An E-government initiative includes IS characteristics in service delivery using the whole IS department or unit to provide information and services, and to

serve citizens. The success of e-government service delivery relies on the entire process of IS to distribute government services via websites. The D&M IS Success Model is chosen as an initial framework to capture e-government service delivery and discover a measurement tool in a Thai context.

4.2.2 The DeLone & McLean IS Success Model

The DeLone & McLean Information System Success Model (D&M IS Success Model) was first created first in 1992 as a framework and model to measure complex variables in IS research. The success of IS was created and aimed to provide better and more consistent success metrics (Petter, et al., 2008), to be more understandable and coherent and provide alternative explanations for the measurement of IS Success (DeLone & McLean, 1992).

The D&M IS Success Model is constructed based on a combination of process and causal approaches in order to help understand the multidimensional nature, interrelationships and meanings of each dimension of success. It is based on communication theory and attempts to understand IS phenomenon and their impacts (DeLone & McLean, 1992).

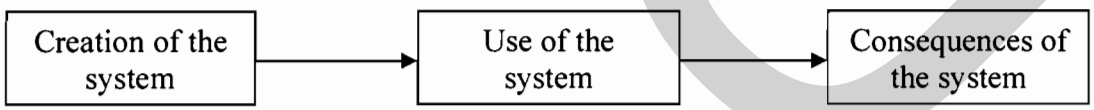

Figure 7 The creation of D&M IS Success Model

Source: Ghandour, Benwell, and Deans (2010)

Figure 7 displays the creation of the D&M IS Success Model (Ghandour, Benwell, & Deans, 2010). The process approach means the steps of the creation, the use, and the consequences of the system. The consequence of the system cannot be obtained without usage. Usage is not possible, if a system is not created (DeLone & McLean, 1992, 2002, 2003). The causal model studies the covariance of the success dimensions to determine if there is any causal relationship among them (DeLone & McLean, 2003).

The D&M IS Success Model 1992 consists of 6 dimensions; System Quality, Information Quality, Intention to Use / Use, User Satisfaction, Individual Impact and Organizational Impact. Information Quality and System Quality are independent dimensions that affect the usage and the users' satisfaction. The influence of user satisfaction has an effect on both individuals and organizations, see Figure 8 (DeLone & McLean, 1992).

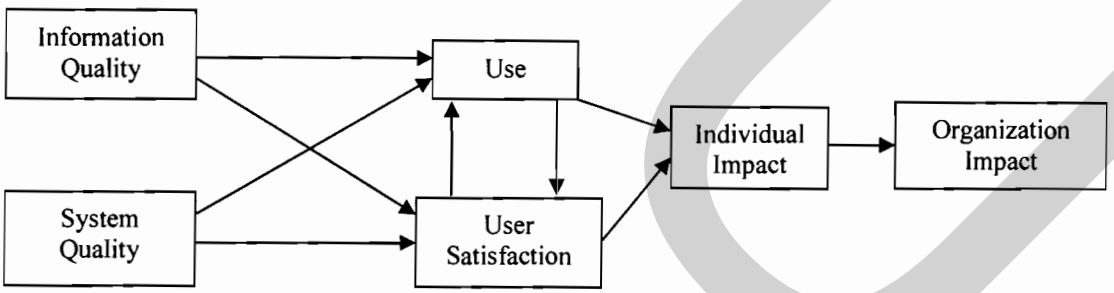

Figure 8 The DeLone and McLean IS Success Model 1992

Source: DeLone and McLean (1992)

The D&M IS Success Model (1992) has been extensively used in IS research both directly and with the extension of online assessment, especially e-commerce, e-business and e-government (DeLone & McLean, 2003; Schaupp, Belanger, & Fan, 2009). The impact of IS success on individuals and organizations has been studied by a number of IS researchers. The relationship among the dimensions and measures have been extensively examined and verified as a causal structure (DeLone & McLean, 2002; Petter & McLean, 2009).

IS practices have changed dramatically since 1992 due to extensive IT development. Internet connection and World Wide Web technology have given more alternatives for business achievement. E-commerce has emerged. Not only products are bought and sold online, but also services are offered through online channels as well. The role of an organization has been transformed from only an information provider to an information and service provider. The D&M IS Success model 1992 was reviewed and revised in 2003. "Service Quality" was included as an additional construct to capture the characteristics of service delivery (DeLone & McLean, 1992, 2003). The updated definition of IS success and corresponding measures are classified into 6 dimensions; Information Quality, System Quality, Service Quality, Intention to Use / Use, User Satisfaction, and Net Benefits (see Figure 9).

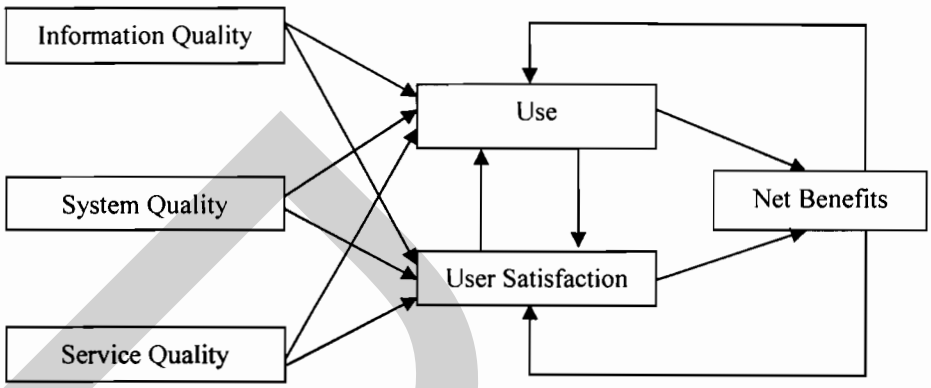

Figure 9 The updated DeLone and McLean IS Success Model 2003

Source: DeLone and McLean (2003)

Service Quality was added as an additional dimension for the reason that IT has been used more in IS to enhance the provision of services. Use was changed to Intention to use / Use because of their roles. Users can be either actual users or potential users (DeLone & McLean, 1992, 2003; Petter, et al., 2008). Not only is a new construct studied, but also the relationship of each construct within the model (DeLone & McLean, 2003; Petter & McLean, 2009; Wang & Liao, 2008).

The impact on individuals and organizations in the 1992 Model was integrated into 'Net Benefits' in the 2003 Model. The impact of IS is not limited to individuals and organizations, as also it can affect workgroups, industries and societies. Researchers have to clearly identify the impact of IS Success when using the 2003 Model. The research procedure has to be able to capture the essence of the impact at both the individual and the organizational levels. This modification allows researchers to identify the level of analysis to fit their objectives and studies (DeLone

& McLean, 1992, 2003; Petter, et al., 2008). It is recommended that each individual measure for each IS Success dimension should be combined to create a comprehensive measurement instrument (DeLone & McLean, 1992, 2002).

In an organization-level instrument, human proxy respondents are used to evaluate the aspect of organizational properties. The assessment can help organizations and practitioners to understand and improve the structure to better fit the organizational environment. An individual-level instrument is used to guide the design and improvement of IS and productivity (Lewis, et al., 2005). To effectively apply the model, researchers should select dimensions and measures based on the objectives and context of the empirical investigation (DeLone & McLean, 2003).

Both the D&M IS Success 1992 and 2003 models are widely used to measure overall performance of IS in several industries (DeLone & McLean, 2003; Gorla, Somers, & Wong, 2010; Petter, et al., 2008; Petter & McLean, 2009; Wang & Liao, 2008) such as business intelligence (Roh, Ahn, & Han, 2005), e-business (Chang, et al., 2011), e-commerce (Ghandour, et al., 2010), knowledge management (Jennex & Olfman, 2008), operations research (Landrum & Prybutok, 2004) and the banking industry (K. C. Lee & Chung, 2009). The nature of the 1992 and 2003 models relies on the organization context. The understanding of the information system of the organization is pre-requisite to applying the model (Petter, et al., 2008).

E-government service delivery is a process in nature. Government produces and prepares information and offers services through government websites. Citizens can access government information and services at anytime and from anywhere via websites. The impacts and benefits are realized by citizens. The D&M IS Success Model is able to capture the service delivery process from the preparation by service

providers, user's consumption and their realization of benefits. Each step is interrelated (DeLone & McLean, 2003; Myers, et al., 1997).

However, application of the D&M IS Success model to evaluate e-government services is still at an early stage. Few researchers have applied the D&M IS Success Model to assess e-government initiatives with different focuses (DeLone & McLean, 2003; Khayun, et al., 2012; Scott, et al., 2009; Wang & Liao, 2008; Wangpipatwong, et al., 2008).

Xuetao Guo and Jie Lu used the model to evaluate e-government online services in Australia to identify the effectiveness of websites. Internal and external users responded to e-government services slightly differently. External users paid more attention to service quality while internal users considered all variables together (Guo & Lu, 2008). Yi-Shun Wang and Yi-Wen Liao (2008) applied the D&M IS Success Model 2003 to evaluate e-government success in the context of government-to-citizen (G2C) in Taiwan. The study revealed that high-quality and up-to-date information and service, security and privacy protection, and personalized services are able to attract more citizens to use e-government systems (Wang & Liao, 2008).

In a Thai context, Wangpipatwong, Chutimaskul, and Papasratorn (2008) applied the D&M IS Success Model 1992 to evaluate Thai e-government websites. The items applied for Information Quality are accuracy, completeness, relevance, timeliness, and understandability. The 1992 model was reviewed and revised in 2003. The suggested indicators from the 2003 model are completeness, relevance, and security (DeLone & McLean, 2003). Vachiraporn Khayun, Peter Ractham, and Daniel Firpo (2012) employed the 2003 model to evaluate trust in the e-government system and focused on the Excise Tax Department. The results showed that increased trust,

perceived information quality, perceived system quality and perceived service quality will influence usage and the level of satisfaction of users and consequently increased net benefits.

The D&M IS Success Model 2003 is chosen as the initiative framework to capture the essence of e-government service delivery in this research study. First, the model illustrates an opportunity to add more variables in order to encapsulate the correct IS environment. Service Quality was added to capture the service offering environment ten year s after the creation of the model (DeLone & McLean, 2003).

Second, the model is able to facilitate the process nature of e-government service delivery through the combination of process and causal characters (DeLone & McLean, 2003). Information and the services of government are prepared by government agencies to be ready on websites. Citizens choose to connect to their government agencies from anywhere and at anytime to use, upload or download what they require. Benefits are recognized by citizens when consuming government services.

Finally, the nature of products and services including the consequences and benefits of an organization can be identified and included in the model to better understand the IS phenomenon. Thus, the impacts of e-government service delivery can be included in the measurement framework and the instrument (DeLone & McLean, 2003; Marchand & Raymond, 2008).

4.2.3 The Research Model

"Participation Quality" is proposed to add as another variable to the D&M IS Success Model 2003 in order to encompass the roles of citizens and government in e-government service delivery. The quality of information is assessed by the inclusion

of the "Information Quality" dimension, the quality of the system by "System Quality", and the quality of services by the "Service Quality" dimension (see Figure 10).

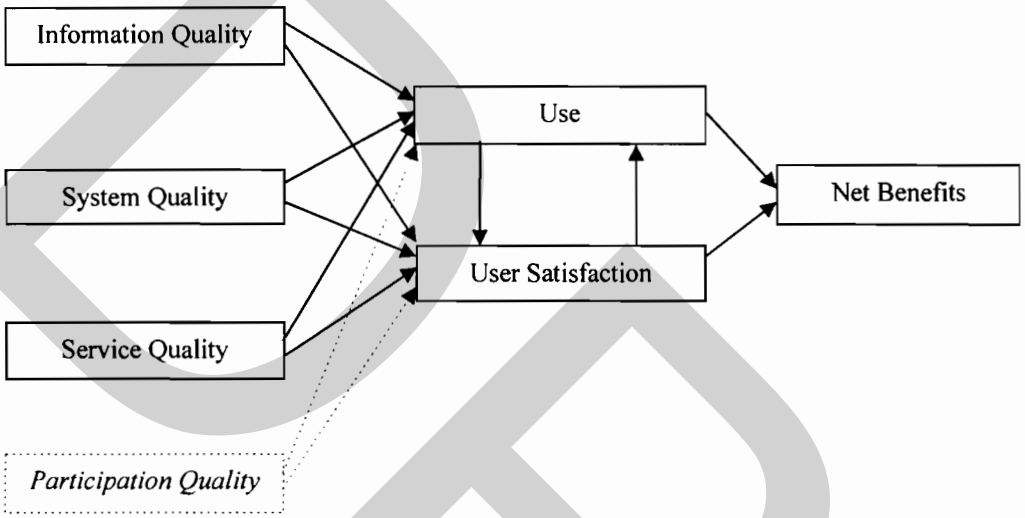

Figure 10 The research model

Source: Developed for this research

Constructs in the research model are latent variables (DeVillis, 2003). They cannot be evaluated directly (Peter, 1981). Dimensions and measures in the research model are translated into operational definitions. The definitions are observable measures and are linked to theoretical properties (DeVillis, 2003; Noar, 2003).

A list of appropriate items has to be searched, selected, and refined for an e-government environment. The items for constructs in this study were selected to represent the theoretical concept. They were mainly adopted from prior studies to ensure content validity (Wang & Liao, 2008). Items for Information Quality, System Quality, and Service Quality are drawn from previous research studies that applied the

D&M IS Success Model 1992 and 2003 in an e-government environment, especially in a Thai context. Some items were employed to evaluate e-government websites in Thailand using the D&M IS Success Model 1992 (Wangpipatwong, et al., 2005, 2008).

Definitions of constructs and indicators are shown in Appendix B.

The research model consists of 7 constructs; Information Quality, System Quality, Service Quality, Participation Quality, Use, User Satisfaction, and Net Benefits. These constructs are linked, and those links are studied to confirm their relationships (DeLone & McLean, 2003; Petter, et al., 2008; Petter & McLean, 2009; Wang & Liao, 2008) except for the newly added construct, Participation Quality.

a) Information Quality

Information has long been considered an importation asset. Information quality captures content issues and measures the success of the information in transferring the intended meaning. It is an important measure that evaluates the output of the information systems. It was one of the dimensions in the D & M IS Success Model created in 1992 (DeLone & McLean, 1992; Petter, et al., 2008).

The relationships of Information Quality, Use and User Satisfaction have been studied and verified to be a supportive path (Petter & McLean, 2009; Rai, Lang, & Welker, 2002; Wang & Liao, 2008). Wangpipatwong, Chutimaskul, and Papasratorn (2008) applied the D & M IS Success Model 2003 to assess Thai government websites in e-government initiatives. The influence of Information Quality, System Quality, and Service Quality had positive effects on the continuation-to-use. The higher the quality, the more users return to make use of e-government services (Wangpipatwong, et al., 2005, 2008).

As a result, two hypotheses are proposed as follows:

H1a: Information Quality is positively associated with the use of e-government service delivery.

H1b: Information Quality is positively associated with user satisfaction with e-government service delivery.

b) System Quality

System Quality was the original dimension in the D&M IS Success model 1992. It was first measured with Information Quality and is considered to be an independent variable that has impact on both individuals and organizations (DeLone & McLean, 1992). It is applied to evaluate the desirable characteristics of IS (Petter, et al., 2008). System Quality refers to the technical details of the information system interface (DeLone & McLean, 1992). The model and its definition were reviewed and adjusted in 2003. System Quality measures the accuracy and efficiency of the communication system that produces information at a technical level (DeLone & McLean, 2003). It is applied to evaluate the desirable characteristics of IS (Petter, et al., 2008).

Other models consider the definition of System Quality differently. For example, Ludwig Christian Schaupp, France Belanger and Weiguo Fan 2009 viewed it as the degree to which a website is easy to use for the purpose of accomplishing a task (Schaupp, et al., 2009). Improvement in the quality of services is expected to lead to high effectiveness of online government services (Guo & Lu, 2008).

The application of the D&M IS Success Model 1992 to evaluate Thai government websites suggested that indicators for a Thai context were dependability, ease of use, functionality, and usefulness (Wangpipatwong, et al., 2005, 2008). When

the 1992 model was reviewed in 2003, more indicators were recommended; efficiency, system availability, and usability (DeLone & McLean, 2003),

Therefore, the following hypotheses are proposed;

H2a: System Quality is positively associated with the use of e-government service delivery.

H2b: System Quality is positively associated with user satisfaction with e-government service delivery.

c) Service Quality

Service quality was added to the D&M IS Success Model in 2003 (DeLone & McLean, 2003). Service quality is a consumer's judgment about the service itself and it is one component of a customer's level of satisfaction. It is used to diagnose the way the organization performs or its efficiency. In the mid-1980, the role of an organization has become a dual role; information provider (producing an information product) and service provider (providing support for end-user developers) (DeLone & McLean, 2002).

IS function can be considered as a service function and serves the information technology needs of the organization. The expansion of end-user computing and the greater number of choices of IS services have driven the IS function towards the understanding of users' expectations, especially for high-quality services. The principle of service quality can be applied to evaluate the quality of services. Originally Service Quality has been evaluated independently (Parasuraman & Zeithaml, 2005; Parasuraman, Zeithaml, & Berry, 1988; Zeithaml, Parasuraman, & Maholtra, 2002). Measuring service quality alone does not provide a complete understanding of the contribution of the IS function to the organization (Myers, et al.,

1997). DeLone and McLean (2003) includes Service Quality as part of measurement of IS function and success.

SERVQUAL has been used as a framework and the beginning of a number of models for online business such as .comQ for retail businesses; eTailQ for cyber-consumers; NetQual for online customers in travel, insurance, digital products, and energy; SiteQual for e-commerce websites (Webb & Webb, 2004); and WebQual for commercial websites (Loiacono, et al., 2002). It is applied in the D&M IS Success Model 2003 to capture service environment (DeLone & McLean, 2003).

In this study, Service Quality means the quality of the support that system users receive from the IS department (Petter, et al., 2008). The suggested indicators are assurance, empathy, reliability, responsiveness, and tangibles (Wangpipatwong, et al., 2008).

The hypotheses are;

H3a: Service Quality is positively associated with the use of e-government service delivery.

H3b: Service Quality is positively associated with user satisfaction with e-government service delivery.

d) Participation Quality

Participation quality refers to the ability of the online services of government agencies to support the political processes, including e-voting and e-decision-making (Macintosh & Whyte, 2008). Citizen participation is a requirement of citizens from the government. The applications of ICT allow citizens to be involved in public administration through government websites (Stahl, 2005).

Participation is part of a citizen's obligation to their government. When ICT was embraced in public administration, the usage was extended from e-government services to facilitate citizen participation and the political processes. Democratic principles can be added to IT from production, consumption, and contribution to an IT-related environment (Stahl, 2005). The principles of democratic governance consist of access, accountability, contestability, equality, openness, and transparency (as cited in Iversen, et al., 2004).

The principles of democratic governance are applied as initiative items for Participation Quality because the Internet is a 'democratic' technology. The rationales are (a) democracy means power in the hands of (many) individuals; (b) information is power; (c) the Internet provides a large amount of information to individuals; and then (d) the Internet is democratic (as cited in Stahl, 2005). However, the internet is considered neutral in this research study.

The hypotheses are;

H4a: Participation Quality is positively associated with the use of e-government service delivery.

H4b: Participation Quality is positively associated with user satisfaction with e-government service delivery.

e) Use

Use is a measure of users' behavior and attitude towards an information system. The quality and productivity of an IS function can be improved and aligned when users actually use it (Myers, et al., 1997). User consumption is a part of the IS practice. Websites are created for users to use. If they are pleased, they tend to come back and use the websites again.

The D&M IS Success Model 1992 applied only "Use" to evaluate the actual use of users. "Intention to Use" was added to the 2003 model in order to describe both actual users and potential users (DeLone & McLean, 2003). Use and Intention to Use are on a voluntary basis and can be applied interchangeably depending on context of the studies (Petter, et al., 2008). Use is applied in this research study.

The two hypotheses are proposed as follows;

H5a: Use is positively associated with user satisfaction with e-government service delivery.

H5b: Use is positively associated with the net benefits of e-government service delivery.

f) User Satisfaction

User satisfaction is one of the key constructs of the D&M IS Success Model (Khalifa & Liu, 2004). It has been applied as a surrogate measure in marketing and business researches including performance measurement in IS researches (Rai, et al., 2002). In the private sector, customer satisfaction has been widely investigated to determine the needs of customers (Hoffman & Bateson, 2006; Petter, et al., 2008; Zeithaml, et al., 2002).

Customer satisfaction is a judgment that a product or service feature, or the product or service itself, provides a pleasurable level of consumption-related fulfillment, including levels of under- or over- fulfillment in the business sector. A product or service must be experienced to make a satisfaction judgment. Customer satisfaction is a more evaluative and emotionally related approach. It is used to diagnose the way customers feel and the measure the effectiveness of service

providers. Positive feedback from satisfied customers has impacts on the position of the providers in the market. Satisfied customers can create positive word-of-mouth and encourage new customers. Providers also gain an advantage over their competitors (Hoffman & Bateson, 2006).

Government has adopted customer satisfaction to evaluate the level of citizen satisfaction (Office of the Public Sector Development Commission, 2003). E-government service delivery is a multidimensional and interrelated process (DeVillis, 2003), while user satisfaction alone should not be used alone as a measure (Petter, et al., 2008, p. 256). User satisfaction has been indirectly measured in information quality, system quality, and service quality. The measurement concept for e-government service delivery has adapted the D&M IS Success Model 2003 to develop a causal relationship between the indirect measure of user satisfaction and the overall level of user satisfaction. A single-item measure was brought from previous studies to evaluate the overall level of user satisfaction (Petter, et al., 2008; Rai, et al., 2002).

The study focuses on the overall satisfaction of users on the usage of e-government service delivery. Thus, the hypotheses are;

H6a: User Satisfaction is positively associated with the use of e-government service delivery.

H6b: User Satisfaction is positively associated with the net benefits of e-government service delivery.

g) Net Benefits

Net Benefits is used to replace the impact of IS at individual and organizational levels in the updated D&M IS Success Model 2003. The influence of IS is addressed at many levels not only individual and organization levels, but also

affects workgroups, industries and societies. Researchers are able to apply Net Benefits at any specified level of relevance (DeLone & McLean, 2003; Petter, et al., 2008).

The IS policy of an organization has to be aligned and adjusted in response to its users. The intended benefits have to be realized, otherwise the organization has failed to provide the desired services and products to users. The private sector has the ability to calculate the benefits in monetary terms, such as profitability, increase of sales volume, retained customers, the number of new customers, the offering of value-added services, etc. The successes of an organization regarding the use of websites are in 4 categories: cost reduction, relationship enhancement, revenue expansion, and time reduction (Apigian, Ragu-Nathan, Ragu-Nathan, & Kunnathur, 2005).

The public sector has different expected benefits. Government aims to reduce costs and increase efficiency of administrative work when applying ICT in an administrative system. Government services are able to be offered through the Internet and websites as an additional channel to reach a wider population inside Thailand and Thais living overseas (Aksararak & Pornwasin, 2004; National Information Technology Committee Secretariat, 2003; "Thailand Information and Communication Technology (ICT) Master Plan (2002-2006)," 2003; Tubtimhin, 2005).

IT 2010 is the Information Technology Policy Framework created by the Ministry of ICT to draw up guidelines for the IT direction of the country. In the e-government section, the goals are to increase the efficiency of back office systems and to enhance the effectiveness of front office systems (National Information Technology Committee Secretariat, 2003). ICT Master Plan 1 (2002-2006) and ICT Master Plan

2 (2009-2013) apply IT 2010 as a guideline to create a dynamic plan for ICT usage in the country. Inputs range from increased budget for infrastructure improvement, integration of operations in providing public services and the enhancement of the capacity of officials. Outcomes are expected to be increased efficiency and effectiveness of administrative works and public services (National Electronics and Computer Technology Center, 2003, 2009).

For the Royal Decree for Good Governance 2003, the expected outputs and outcomes from using IT are enhanced effectiveness, cost saving when providing services, and the reduction of tedious work processes (Office of the Public Sector Development Commission, 2003).

In the Public Sector Reform Initiative, IT is used as part of the reform plan. Thai Public Sector Development Strategies B.E. 2546-2550 (2003-2007) and B.E. 2551-2555 (2008-2012) are produced to enhance administrative work and the democratic environment. Transparency and accountability are to be ensured for public sector management (Office of the Public Sector Development Commission, 2003).

One of the goals of Thai government reform is to provide a better quality of services to its citizens. Each government agency has already included quality of services into its strategic objectives and administrative works. Although net benefit might have been realized, users' feedback with regard to better service quality has to be discovered systematically. Government activities such as bidding and voting can be done through websites in order to increase transparency and security (Aksararak & Pornwasin, 2004).

The study focuses on the benefits from the citizens' perspective. The suggested indicators are better quality of services (greater efficiency) (Office of the

Public Sector Development Commission, 2003), enhanced participation (National Electronics and Computer Technology Center, 2009), good governance (National Electronics and Computer Technology Center, 2009; Office of the Public Sector Development Commission, 2003), greater performance (effectiveness) (Office of the Public Sector Development Commission, 2003), better value for money (lower cost) (Office of the Public Sector Development Commission, 2003), responsiveness to user needs (favorable services) (Office of the Public Sector Development Commission, 2003) and transparent (National Electronics and Computer Technology Center, 2009).

Content validity in stage I is obtained by selecting a framework based on IS theory that embraces the phenomenon surrounding e-government service delivery. Torjib and Sugianto (2006) stated that content validity can be established through a two-stage process; development and judgment. The development of content validity is in stage I where domain is conceptually indentified together with its definitions. A set of measures and recommended items are generated in stage I and validated through the judgment process in stage II (Instrument Development). See the list of item and their description in Appendix C.

4.3 Instrument Development

An instrument is developed in stage II. Stage II comprise three steps; pre-test, pilot test, and item screening. A list of the recommended items and their descriptions from stage I are utilized to draft an instrument. The description of items is derived from previous research papers (Lewis, et al., 2005) including journals and government documents. Item descriptions have to be clear and understandable to samples. Recommendations on the writing of good items are (a) be clear and concise,

(b) try to avoid jargon or slang, and (c) avoid ambiguous and double negative meanings (as cited in Noar, S. M., 2003).

The instrument, in questionnaire form, consists of three parts: the demographic profile of the respondent, the name of a government website (most often used), and the level of satisfaction towards the usage of e-government websites. The demographic profile of respondents is information about gender, age group, education, and employment. Part 2 requests the name of a Thai government website that a respondent uses most often. Part 3 is categorized in accordance with the dimensions of the proposed model: Information Quality, System Quality, Service Quality, Participation Quality, Net Benefits, Use, and overall user satisfaction.

A 7 point Likert-Scale is employed as a measurement scale in this study (Lewis, et al., 2005; Wangpipatwong, et al., 2008). The instrument is scaled from one to seven; 1 = Highly dissatisfied, 2 = Dissatisfied, 3 = Slightly Dissatisfied, 4 = Neutral, 5 = Slightly Satisfied, 6 = Satisfied, and 7 = Highly satisfied.

The questionnaire is composed in the English language because references are mainly presented in the English language. The questionnaire was sent to a proof reader to ensure that the language is employed in an academic manner. The international program of Dhurakij Pundit University, International College (DPU IC), offers proof reading services to make certain of international standards of English language usage.

The pre-specified samples are mostly Thai nationals. The questionnaire had to be translated into Thai language. The questionnaire was sent to a professional translator to translate into the Thai language. However, the professional translator did not understand the actual meaning of the questionnaire. Additional readers were

required to review, adjust and simplify the wordings and sentences in the Thai language. The meaning from English language had to be verified by experts.

The questionnaire in both Thai and English languages was sent to two teachers of English language for revision. They understood both the Thai and English languages. Explanation and discussion were made during the translation and adjustment. Some English words had several meanings in the Thai language. Wordings had to be carefully decided and chosen. Clarification is the important part in order to portray and contain the intended meanings (Noar, 2003). After that, the questionnaire was employed in a pre-test.

4.3.1 Pre-test

The questionnaire was pre-tested to get empirical feedback from highly controlled samples. The rationale is to link the intended meaning of the questions in the English language with the Thai language including format, content, understandability, terminology and speed of completion (Lewis, et al., 2005). The questionnaire was thoroughly discussed to ensure the clarity of items and their descriptions. Questions and the description of items were well defined, clearly understood, and presented in a consistent manner (Lancaster, Dodd, & Williamson, 2004).

The questionnaire both in the Thai and English language was sent to two academics, a PhD graduate and four PhD candidates as critical readers. They have acquired knowledge in the research processes and have gone through the same research processes. They understand both the Thai and English languages and have fulfilled the PhD candidate requirements of the Ministry of Education, Thailand. The

intended meaning in the English language was accurately translated into Thai language for academic purposes.

Samples were asked to consider the following elements:

- Clearness if meanings of items in the English language were completely translated into the Thai language,
- Whether there were any unnecessary or repeated questions,
- Format and terminology are comprehensible and appropriate, and
- How long it takes to complete the questionnaire.

Recommendations were made in two areas: the English language in questionnaire and the readjustment of some sentences. Respondents were able to compare sentences if the intended meanings were comprehended. See details of comments and suggestions in Appendix D.

- The unclear sentences were readjusted. Items were added as necessary to cover the full meanings of ambiguous items.
- The request list of websites respondents visited most often was reduced from three to one.
- Some items were rewritten to make it clearer to readers, including the rephrasing deletion and replacement of some Thai words with understandable words without changing the true meaning of the sentences.
- Sentences were re-checked and proofread both in Thai and English.

All respondents recommended that the questionnaire should be presented to samples both in the Thai and English languages. Samples should be asked whether they prefer a Thai/English questionnaire. If not, they should be asked which one is their preferred language when answering the questionnaire.

A pilot test with the pre-specified samples was carried out to ensure comprehension of all questions.

4.3.2 Pilot test

A Pilot test is undertaken to appraise and purify the instrument. The pre-defined samples were requested to fill in the instrument and provide comments in regard to difficulties in completing the instrument, and its improvement. Adjustments were made in according to the observation of respondents (Lewis, et al., 2005). The revised instrument was presented to samples in both Thai and English.

Samples were asked to consider the following elements:

- The Language they prefer: Thai or English,
- Whether the terminology and meanings were easy to understand,
- Whether the format was easy to read to facilitate the answering process, and
- Time to compete the questionnaire.

The first comment from respondents was the request for a Thai language version only. The Thai/English questionnaire was too long and not easy to read. Respondents understood the Thai language better than the English language. The questionnaire was changed to Thai language only and resent to the samples.

Suggestions were as follows:

- Thai language was the desirable language of most respondents. It is easy to understand and smoothed the answering process.
- Typo should be changed to support the Thai alphabet with an increased font size.
- Respondents spent 10 to 25 minutes to answer the questionnaire. Some requested to reply in their free time, not within working hours.

There was no recommendation to delete any items. 89 items are maintained in the questionnaire.

4.3.3 Item Screening

Item screening involves the selection of indicators to retain or remove items from the measurement instrument. In this stage, content validity is obtained through judgment by experts and the quantitative method, the content validity ratio (CVR). CVR created by Lawshe (1975) is employed in this study following the Construct Development Method (Lewis, et al., 2005). The purpose is to evaluate whether an item is statistically significant, and then it should be remain in the instrument. The irrelevant items should be discarded.

Emails were sent to experts requesting their input about the constructs and items related to the measurement of e-government service delivery in a Thai context. Experts who have experience were able to provide insight information or opinions on e-government initiatives (Lawshe, 1975; Lewis, et al., 2005).

A list of constructs and items were given to eight experts to rank each item on a three-point scale (1 = Not relevant, 2 = Important but not essential, and 3 = Essential). The number of experts should range from 1-2 (Creswell & Clark, 2007) or minimum of 3 (Lewis, et al., 2005). Lawshe (1975) recommended the minimum number of five in the table of "Minimum values of CVR and CVR_t" (Lawshe, 1975).

The value of CVR ranges from 0 to 1.0 (or adjusted to 0.99 for ease of computation) (Lawshe, 1975). Calculation was made by applying the following formula:

$$CVR = (n - N/2)/(N/2)$$

N is the total number of respondents, *n* is the frequency count of the number of panelist rating item as appropriate, 1 = Not relevant, 2 = Important but not essential, and '3 = Essential (Lawshe, 1975; Lewis, et al., 2005).

Five experts replied and the calculation of the CVR value is summarized in Appendix E. Items of four constructs, Information Quality, System Quality and Participation Quality, were ranked "3" (Essential). The greater the number of experts who perceive it to be "essential", the greater the degree of content validity.

Empathy and Tangibility in Service Quality Construct were ranked "2" (Important but not essential). Responses of "2" and "3" are positive ranks and the retention of those indicators is justified (Lewis, et al., 2005). It is recommended by Lawshe (1975) that if more than half of experts choose to rank "3 (Essential)", that indicator is perceived to have greater degree of content validity and can be retained in the instrument (Lawshe, 1975). Empathy and Tangibility are kept in the Service Quality construct. The CVR value indicated that all items are statistically significant and appropriate to measure the constructs.

The second stage of content validity establishment (Tojib & Sugianto, 2006) is obtained through the application of CVR. Judgment from experts, in numerical terms, was computed and compared in order to remove or retain items. The recommended items are purified through a pre-test, a pilot test and by item screening. Selection and suggestions were made by both samples and experts. Translation of the instrument (English to Thai language) was carefully conducted. A qualitative approach (pre-test and pilot test) and a quantitative approach (item screening) were employed to increase the quality of the research.

All 89 items are retained in the instrument. A recruitment email was created with a hyperlink to the online questionnaire. The next step was the pilot study. Recruitment emails were sent to the samples and their input was requested about e-government service delivery.

4.4 Pilot Study

The pilot study plays an important role in research study. Clear roles and objectives within a formal framework ensure a high quality study and results including methodological rigor, scientific validity and publishable research. However, testing survey administration in a pilot study is not the same as validating any instrument (Lancaster, et al., 2004).

Recruitment emails were sent out to the pre-specified samples (250). The data collection period was 4 weeks. The sample size is also an important aspect of a pilot study. Generally, the suggest number of samples is 40-200. In clinical research, 30 samples are advised (Lancaster, et al., 2004). In IS research, the minimum number is 40 (Lewis, et al., 2005).

Fifty samples responded to the recruitment email and answered the online questionnaire. Incomplete questionnaires were examined and removed (4) because more than half of the answers were missing. The total number of complete questionnaires for this study was 46.

The response rate was 18.40%.

4.4.1 Characteristics of respondents

Demographic features are presented in Table 10. The majority of respondents were female (73.9%). Less than half of the males (26.1%) answered the questionnaire. See Table 10.

Table 10 Demographic characteristics of respondents of the pilot study ($N = 46$)

Category	Frequency	Percentage (%)
Gender		
Female	34	73.9
Male	12	26.1
Age		
≤ 20	7	15.2
21-30	17	37.0
31-40	10	21.7
41-50	11	23.9
51-60	1	2.2
≥ 60	-	-
Education		
Certificate / Diploma	1	2.2
High school	-	-
Undergraduate	27	58.7
Postgraduate	17	37.0
Others	1	2.2
Employment profile		
Employee	19	41.3
Student	19	41.3
Business owner	3	6.5
Government officer	-	-
State enterprise officer	-	-
Others	5	10.9

Source: Developed for this research

The age group ranged from under 20 years old to 60 years old. Most of samples are in 21-30 age group (37.0%) followed by 41-50 (23.9%), 31-40 (21.7%) and under 20 age group (15.2%) respectively. No respondent was over 60 years old.

Education is divided into four groups: high school, diploma, undergraduate and postgraduate degree level. The majority of respondents obtained a degree or was studying in undergraduate level (58.7%). The second largest group held a degree at postgraduate level (37%). A small number of respondents acquired diploma level (2.2%). None were from high school level.

The percentage of students who completed the questionnaire was employees (41.3%). A small percentage was business owners (6.5%). None of respondents in the pilot study worked in the governments sector or state enterprise agencies.

4.4.2 List of Thai government websites

Twenty-four websites were mentioned and the list is shown in Appendix F. The first ten websites are discussed. The most-liked website is the Tourism Authority of Thailand website (19.57%). 10.87% visited the website of the Revenue Department most often, followed by websites of the Disaster Prevention and Mitigation Nonthaburi Provincial Office (6.52%) and the State Railway of Thailand (6.52%).

Other websites are the Government Lottery Office (6.52%), the Office of Higher Education Commission (4.35%), the Social Security Office (4.35%), Student Loan (4.35%), the Airport of Thailand PLC (2.17%), and the Bureau of Tourism Business and Guide Registration (2.17%).

4.4.3 Descriptive statistics

Descriptive statistics are designed to examine the distribution of the scores of the instrument. The values of means and standard deviation including skewness and kurtosis are calculated to assess data distribution. The results can be viewed in Appendix F.

Mean is the most widely used measure of central tendency (Lewis, et al., 2005). The Likert scale of this study is 1-7. Item means of constructs range from 4.15 to 4.57. High item means shows a high satisfaction level of users towards e-government service delivery. Standard deviation is the square root of the variance. It measures the spread of a set of observations. The larger the standard deviation is, the more spread out the observations are. Standard deviation of items ranges from 1.0 to 1.5.

Skewness measures the degree and direction of asymmetry. A symmetric distribution such as a normal distribution has a skewness of 0. A distribution is skewed to the left when the mean has a negative skewness, and to the right with a positive value. The suggest statistical value for skewness is < 2 (Castro, Kellison, Boyd, & Kopak, 2010). Skewness of ±1 is recommended as an acceptable range (Noar, 2003). The skewness statistic of most of the items is 1 or less, except EOU1, EFF1, UFN2, UFN3, NB1BS, and U3 where the value is slightly above 1; .002, .017, .069, .155, .036, and .003 respectively. They are utilized in the next step.

Kurtosis is a measure of the heaviness of the tails of a distribution. A normal distribution has a kurtosis of 0. Kurtosis is positive if the tails are "heavier" than for a normal distribution and negative if the tails are "lighter" than for a normal distribution. Normal distributions will have kurtosis values close to 0. Absolute values

of 0-2 are acceptable (Castro, et al., 2010; Noar, 2003). The kurtosis of items is within the recommended values except EFF2, USA3, and UFN3 where the value is slightly above the recommended value; .25, .1 and .543 respectively. They will be used in the following step.

The skewness and kurtosis statistics of the pilot study were well within the tolerable range for assuming a normal distribution.

4.4.4 Reliability and validity analysis

Churchill (1979) employed Cronbach's Alpha and Corrected Item-Total Correlation as criteria to retain or remove items from the pilot study. Cronbach's Alpha is important in the assessment of reliability (Churchill, 1979; Cronbach, 1951; Lewis, et al., 2005). Corrected Item-Total Correlation and exploratory factor analysis can provide useful preliminary analyses of data (Gerbing & Anderson, 1988). Reliability analysis and validity of pilot study is displayed in Table 11.

Table 11 Reliability and validity analysis of pilot study ($N = 46$)

Construct	Item	Cronbach's Alpha	Corrected Item-Total Correlation	Factor Loadings*
Information Quality	(Number of items = 18)	0.962		
	Accuracy 1		.476	.908
	Accuracy 2	.680	.656	.566
	Accuracy 3		.636	.718
	Completeness 1		.830	.857
	Completeness 2	.930	.817	.764
	Completeness 3		.839	.788
	Relevance 1		.866	.840
	Relevance 2	.904	.763	.762
	Relevance 3		.845	.799
	Security 1		.759	.724
	Security 2	.887	.696	.782
	Security 3		.606	.810
	Timeliness 1		.779	.676
	Timeliness 2	.869	.705	.678
	Timeliness 3		.680	.726
	Understandability 1		.792	.776
	Understandability 2	.930	.882	.852
	Understandability 3		.843	.755

Table 11 Continued

System Quality	(Number of items = 24)	.969		
	Dependability 1		.796	.723
	Dependability 2	.923	.821	.867
	Dependability 3		.818	.885
	Ease of use 1		.656	.782
	Ease of use 2	.888	.654	.919
	Ease of use 3		.736	.885
	Efficiency 1		.783	.813
	Efficiency 2	.891	.760	.865
	Efficiency 3		.767	.836
	Functionality 1		.792	.725
	Functionality 2		.659	.652
	Functionality 3	.869	.617	.854
	Functionality 4		.748	.717
	Functionality 5		.765	.826
	System availability 1		.747	.850
	System availability 2	.860	.828	.791
	System availability 3		.724	.625
	Usability 1		.793	.752
	Usability 2	.920	.814	.858
	Usability 3		.897	.845
	Usefulness 1		.840	.798
	Usefulness 2	.858	.586	.794
	Usefulness 3		.714	.768
	Usefulness 4		.689	.572
Service Quality	(Number of items = 16)	.982		
	Assurance 1		.769	.910
	Assurance 2	.943	.755	.924
	Assurance 3		.900	.859
	Assurance 4		.913	.864
	Empathy 1	.942	.893	.873
	Empathy 2		.918	.862
	Empathy 3		.910	.876
	Reliability 1	.936	.904	.841
	Reliability 2		.936	.931
	Reliability 3		.886	.866
	Responsiveness 1	.961	.882	.860
	Responsiveness 2		.820	.841
	Responsiveness 3		.924	.933
	Tangibility 1	.920	.903	.865
	Tangibility 2		.899	.894
	Tangibility 3		.805	.686
Participation Quality	(Number of items = 20)	.973		
	Access 1	.875	.517	.482
	Access 2		.527	.740
	Access 3		.573	.773
	Access 4		.754	.824
	Accountability 1		.868	.805
	Accountability 2	.947	.850	.763
	Accountability 3		.823	.716
	Contestability 1		.887	.848
	Contestability 2	.928	.858	.870
	Contestability 3		.809	.787

Table 11 Continued

Construct	Item	Cronbach's Alpha	Corrected Item-Total Correlation	Factor Loadings*
	Equality 1	.899	.838	.739
	Equality 2		.823	.809
	Equality 3		.751	.660
	Equality 4		.819	.737
	Openness 1	.838	.681	.680
	Openness 2		.898	.915
	Openness 3		.870	.906
	Transparency 1	.941	.869	.830
	Transparency 2		.855	.860
	Transparency 3		.889	.831
Net Benefits	(Number of items = 7)	.967		
	Better service quality 1		.878	.831
	Good governance 2		.918	.888
	High performance 3		.909	.870
	Value for money 4		.834	.768
	Favorable services 5		.890	.845
	Enhance participation 6		.845	.785
	Transparency 7		.917	.885
Use	(Number of items = 3)	.928		
	Use 1		.926	.940
	Use 2		.822	.849
	Use 3		.819	.846

Note: * Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Source: Developed for this research

Reliability refers to the consistency or stability of the questionnaire results. If the value of Cronbach' Alpha is equal to or exceeds 0.7, that item can be retained in the instrument. It is desirable if the value goes over 0.8 (Churchill, 1979; Lewis, et al., 2005; Nunnaly, 1978).

Correct Item-Total Correlation provides preliminary analysis of data (Gerbing & Anderson, 1988). If the value is equal to or more than 0.5, that item can be kept for further study (Churchill, 1979). Correct Item-Total Correlation of 88 items, except User Satisfaction, vary from 0.517 – 0.936, which is above the cut-off. However, the value of Accuracy 1 is 0.476, slightly below the cut-off (0.024).

Factor loadings are applied to evaluate consistency between items in a

factor. A high factor-loading threshold ensures greater within-factor correlation, which improves reliability. The cut-off value is ≥ 0.5 (Churchill, 1979; Lewis, et al., 2005). The results of factor loadings range from 0.566 to 0.940 except for the value of Access 1 in Participation Quality (0.482).

Even though Cronbach's Alpha and Correct Item-Total Correlation are applied in order to select items and purify the instrument in the pilot study (Churchill, 1979), subjective selection of items is advisable under some conditions (Lewis, et al., 2005). The results showed that Cronbach's Alpha value of Accuracy in the Information Quality construct held a value slightly below the recommended value. Cronbach's Alpha value of Accuracy 1, 2 and 3 item is 0.68, a little below the recommended cut-off (0.02).

Correct Item-Total Correlation of only Accuracy 1 is 0.476, slightly below the recommended value (0.024). Accuracy 2 and Accuracy 3 items were 0.656 and 0.636 respectively, which are above the cut-off value. Furthermore, Factor Loadings of Accuracy 1, 2 and 3 are 0.908, 0.566, and 0.718 respectively. The values are higher than the recommended factor-loading threshold of 0.5.

Only two items of this instrument should be removed: Accuracy 1 in the Information Quality construct and Access 1 in the Participation Quality construct. The total number of items was reduced from 89 to 87 items. The number of items to be removed is too small (2 items) and their statistical values are slightly below the recommended value. Accuracy 1 and Access 1 are thus kept for further evaluation. It should be noted that User Satisfaction is a single-item measure. Cronbach's Alpha, Corrected Item-Total Correlation, and Factor Loadings cannot be computed at this stage.

Overall, these analyses indicated that the constructs were underlying e-government service delivery and the items were moderately internally consistent. None of the items were eliminated, and the proposed constructs were retained. An approximate normal distribution was evident, thus the data were well suited for parametric statistical analyses.

The instrument consists of 89 items and is prepared in an online questionnaire form. The questionnaire is divided into three parts: the demographic information of respondents, a list of one Thai government website (often used), and the level of satisfaction towards e-government service delivery. An invitation email was sent to samples through email and via contact persons of organizations.

Hyperlink to the online questionnaire was included in the recruitment email. If a sample forgets to answer any question, they were asked to recheck their feedback before submission. However, the system was unable to detect if there were any technical problems such as internet disconnection or a power supply problem.

The questionnaire is displayed in Appendix G.

4.5 Data Collection and Respondents' Characteristics

The revised instrument from stage II was employed to evaluate the measurement properties, the exploratory factor analysis (EFA), the confirmatory factor analysis (CFA), and the hypothesis testing in stage III. Data were collected, analyzed and validated as advised in the Construct Development Method (Lewis, et al., 2005). Users were randomly selected in order to be able to represent a population and the result and can thus be generalized to a population (Creswell & Clark, 2007).

The study sought to send invitations by email to several databases; e-learning for IT teachers, faculty members of Dhurakij Pundit University (DPU) and Rangsit University, and a group of students from Rangsit University (Tour Guide Group) and Rajabhat Suan Dusit (Principle of Tourism courses). Invitations were extended to the business sector in financial departments, and other companies. Telephone calls were made in advance to ask for permission. Contacts in social networking, especially Facebook and alumni networks, were invited to answer the online survey.

4.5.1 Response rate and non-response bias

The minimum number of responses for the main study is calculated by the subject-to-item ratios of at least 5 to 1 (Hair, Anderson, Tatham, & Black, 1995; Lewis, et al., 2005; Peter, 1979). Garver and Mentzer (1999) recommended the minimum sample sizes should be at least 200 observations to obtain trustworthy estimates. The number of items in this study was 89. With a 5 to 1 ratio, the minimum response should be 445.

Sample size is an important element in any statistical test including instrument development. It provides a basis for the estimation of sampling error (Lewis, et al., 2005; Peter, 1979). Hair, Anderson, Thatham, and Black (1998) suggested the number of sample size should be 200-400 respondents. All significant results should be examined to ensure practical significance including statistical power when the number of samples increases (Hair, et al., 1998, p. 23).

a) Response rate

Approximately 3,000 recruitment emails were sent via email and social networking. Samples were requested to answer the survey and submit their feedback

via an online system. The collection period was 8 weeks from the second week of February to the first week of April 2012. Four-hundred and seventy-five were submitted.

The number of survey submissions (475) was higher than the minimum requirement (445). Incomplete questionnaires (18) were eliminated. Data of each incomplete questionnaire were removed, mostly part 3 was not displayed. There was no measure for the incomplete questionnaire. The server system itself cannot investigate which respond had technical problem or started but did not complete the survey.

The remaining complete questionnaires (457) were employed in this study. The response rate was 15.23%.

b) Non-response bias

Non-response bias is defined as the difference between the answers of non-respondents and respondents (Lambert & Harrington, 1990). The testing of non-response bias was performed to ensure a representative sample. Investigations are necessary to discovery whether the estimates of interest might be subject to non-response errors (Sax, Gilmartin, & Bryant, 2003).

In practice, there is no data of non-respondents. Researchers usually test non-response bias by assuming the last quartile of respondents to be most similar to those of the first quartile. A t-test analysis was used to check the differences between respondents and non-respondents (Lambert & Harrington, 1990).

Levene's Test was employed to examine the homogeneity of variance and the independent sample t-test was applied to investigate the equality of means. In theory, if p-value (significance) is less than 0.05 ($p < 0.05$), Levene's test indicates

that variances between the two populations are not equal, the t-test assuming unequal variances. If $p > 0.05$, Levene's test indicates that equal variances can be assumed or homogeneity of variance exists. Then the t-test assuming equal variance can be used. For the independent sample t-test, if $p > 0.05$, there are no differences in the mean value between two groups of respondents.

The results of Levene's test and t-test for the main study are displayed in Appendix H, section a. The t-tests of all items demonstrated no significant differences between the mean scores of the two groups. Then equal variances were assumed. The results imply that respondents were not different from non-respondents. Non-response bias was insignificant and the survey was able to acquire sufficient data in this study.

4.5.2 List of Thai government websites

A total of 84 websites was listed in the main study and the results are displayed in Appendix H, section b. The Revenue Department (www.rd.go.th) is the most widely-used Thai government website. 21.23% of the respondents logged-in to this website most often. The major role of this department is involved with taxes both for individual and business sectors. E-filing for taxes and online forms are offered together with a handbook and other related information. Websites of the Ministry of Foreign Affairs (www.mfa.go.th), the Government Lottery Office (www.glo.or.th) came in the second (5.24%) and third place (4.60%) respectively.

Other websites are the Tourism Authority of Thailand (3.94%), Kasetsart University (3.06%), the Bank of Thailand (2.63%), the Department of Business Development (2.41%), the Department of Local Administration (1.75%), the Department of Lands (1.53%), and the Ministry of Labor (1.53%).

4.5.3 Demographic characteristics

Respondents' demographic profiles are displayed in Table 12.

Table 12 Demographic characteristics of respondents of the main study (N = 457)

Category	Frequency	Percentage (%)
Gender		
Female	272	59.3
Male	185	40.7
Age		
≤ 20	27	5.9
21-30	195	42.7
31-40	130	28.4
41-50	87	19.0
51-60	18	3.9
≥ 60	-	-
Education		
Certificate / Diploma	6	1.3
High school	15	3.3
Undergraduate	260	56.9
Graduate	170	37.2
Others	6	1.3
Employment profile		
Employee	221	48.4
Student	66	14.0
Business owner	56	12.3
Government officer	37	8.1
State enterprise officer	10	2.2
Others	67	15.1

Source: Developed for this research

Demographic profile consists of information about gender, age group, education profile, and employment profile. With regards to gender, the number of female respondent was higher than males (59.3%). The percentage of males was lower (40.7%).

Considering the age group of respondents, most of them are in the 21-30 age groups (42.7%). The second largest group is respondents is in 31-40 age group (28.4%) followed by the 41-50 age group (19.0%) and the under 20 age group (5.9%). There is no respondent with an age over 60.

The majority of respondents were employees (48.4%). The second largest groups were students (14%) followed by business owners (12.3%). A limited number of respondents work in the government sector: government officers (8.1%) and state enterprise officers (2.2%).

4.5.4 Descriptive statistics

Descriptive statistics are designed to examine the distribution of the scores of the instrument. The values of means and standard deviation are calculated to examine the central tendency, and skewness and kurtosis are computed to examine the dispersion of data (Neuman, 2006). Table 13 contains a summary of the statistical properties of the measures in the main study including the number of items, minimum and maximum, means, standard deviation, skewness, and kurtosis values.

Minimum and maximum value was the representation of the Likert scale of the items; strongly disagree (1) to strongly agree (7). Minimum value of almost all of the items was 1 (strongly disagree) except accuracy 3, dependability 2, and contestability 1 which was 2 (disagree). The maximum value of all items was 7 (strongly agree).

The value of means of items ranged from 4 to 5 which were considered positive or slightly satisfied compared with Likert scale type 1-7 (Strongly Dissatisfied – Strongly Satisfied). The mean value of constructs ranged from 4 to 5; Information Quality (4.903), System Quality (4.952), Service Quality (4.252),

Participation Quality (4.692), Net Benefits (4.726), Use (5.048) and User Satisfaction (4.96).

Standard deviation is an indication of the average distance between the score and the mean or evaluation of dispersion for one variable. Standard deviation is practical for comparison purposes (Neuman, 2006). Standard deviation of items ranges from 1.0 to 1.4.

Table 13 Descriptive statistics for the main study ($N = 457$)

Construct	Item	Min	Max	Mean	Std. Deviation		Skewness	Kurtosis
Information Quality	(Number of items = 18)			4.903	17.624			
	Accuracy 1	1	7	5.15	1.252		-.776	1.005
	Accuracy 2	1	7	5.22	1.183	3.278	-.694	.938
	Accuracy 3	2	7	5.14	1.189		-.406	-.093
	Completeness 1	1	7	4.90	1.303		-.426	-.551
	Completeness 2	1	7	4.78	1.350	3.611	-.367	-.348
	Completeness 3	1	7	4.74	1.292		-.201	-.416
	Relevance 1	1	7	4.87	1.269		-.224	-.516
	Relevance 2	1	7	4.88	1.205	3.306	-.354	.083
	Relevance 3	1	7	5.10	1.141		-.439	.283
	Security 1	1	7	4.99	1.253		-.460	-.106
	Security 2	1	7	4.94	1.221	3.177	-.424	.231
	Security 3	1	7	4.82	1.109		-.217	.158
	Timeliness 1	1	7	4.67	1.435		-.672	.185
	Timeliness 2	1	7	4.82	1.377	3.847	-.491	-.038
	Timeliness 3	1	7	4.79	1.469		-.663	.017
	Understandability 1	1	7	4.74	1.346		-.613	.425
	Understandability 2	1	7	4.83	1.292	3.497	-.600	.484
	Understandability 3	1	7	4.86	1.236		-.360	.086
System Quality	(Number of items = 24)			4.952	23.112			
	Dependability 1	1	7	4.87	1.220		-.383	-.023
	Dependability 2	2	7	4.82	1.240	3.394	-.257	-.293
	Dependability 3	1	7	4.81	1.188		-.309	.103
	Ease of use 1	1	7	4.90	1.214		-.518	.802
	Ease of use 2	1	7	4.88	1.275	3.420	-.483	.371
	Ease of use 3	1	7	4.78	1.301		-.511	.186
	Efficiency 1	1	7	5.08	1.220		-.402	.260
	Efficiency 2	1	7	5.12	1.145	3.233	-.330	.427
	Efficiency 3	1	7	5.15	1.219		-.622	.277

Table 13 Continued

Construct	Item	Min	Max	Mean	Std. Deviation		Skewness	Kurtosis
	Functionality 1	1	7	5.01	1.239		-.518	.752
	Functionality 2	1	7	4.83	1.256		-.283	.033
	Functionality 3	1	7	5.09	1.207	5.301	-.651	.522
	Functionality 4	1	7	4.68	1.487		-.498	-.237
	Functionality 5	1	7	4.74	1.292		-.270	-.167
	System availability 1	1	7	4.88	1.302		-.491	.217
	System availability 2	1	7	4.88	1.237	3.525	-.390	.161
	System availability 3	1	7	4.68	1.372		-.324	-.046
	Usability 1	1	7	4.87	1.195		-.320	.020
	Usability 2	1	7	5.00	1.178	3.321	-.214	.019
	Usability 3	1	7	4.88	1.202		-.386	.248
	Usefulness 1	1	7	5.03	1.203		-.355	.046
	Usefulness 2	1	7	5.38	1.291	4.415	-.761	.585
	Usefulness 3	1	7	5.40	1.230		-.726	.661
	Usefulness 4	1	7	5.08	1.418		-.634	.260
Service Quality	(Number of items = 16)			4.252	17.048			
	Assurance 1	1	7	4.45	1.099		-.490	.775
	Assurance 2	1	7	4.42	1.177	4.254	-.499	.755
	Assurance 3	1	7	4.36	1.169		-.435	.741
	Assurance 4	1	7	4.39	1.215		-.247	.221
	Empathy 1	1	7	4.30	1.274		-.474	.423
	Empathy 2	1	7	4.08	1.321	3.583	-.333	.247
	Empathy 3	1	7	4.17	1.227		-.411	.630
	Reliability 1	1	7	4.46	1.180		-.295	.570
	Reliability 2	1	7	4.21	1.154	3.237	-.636	.947
	Reliability 3	1	7	4.22	1.208		-.407	.899
	Responsiveness 1	1	7	4.05	1.266		-.371	.370
	Responsiveness 2	1	7	4.04	1.312	3.736	-.147	.259
	Responsiveness 3	1	7	4.09	1.355		-.158	.009
	Tangibility 1	1	7	4.19	1.334		-.405	.296
	Tangibility 2	1	7	4.03	1.279	3.469	-.263	.031
	Tangibility 3	1	7	4.58	1.301		-.293	.063
Participation Quality	(Number of items = 20)			4.692	18.034			
	Access 1	1	7	4.80	1.235		-.391	.258
	Access 2	1	7	5.08	1.207	4.223	-.446	.081
	Access 3	1	7	5.17	1.143		-.697	1.376
	Access 4	1	7	5.05	1.205		-.702	1.103
	Accountability 1	1	7	4.83	1.138		-.151	-.086
	Accountability 2	1	7	4.78	1.219	3.319	-.143	.409
	Accountability 3	1	7	4.62	1.199		-.133	.413
	Contestability 1	2	7	4.48	1.166		.143	-.187
	Contestability 2	1	7	4.48	1.149	3.364	-.324	.473
	Contestability 3	1	7	4.25	1.309		-.253	.476

Table 13 Continued

Construct	Item	Min	Max	Mean	Std. Deviation		Skewness	Kurtosis
	Equality 1	1	7	4.90	1.217		-.482	.718
	Equality 2	1	7	4.53	1.262	4.263	-.291	.265
	Equality 3	1	7	4.82	1.212		-.167	.239
	Equality 4	1	7	4.73	1.235		-.409	.563
	Openness 1	1	7	5.08	1.189		-.400	.343
	Openness 2	1	7	4.40	1.242	3.096	-.241	.493
	Openness 3	1	7	4.28	1.269		-.342	.654
	Transparency 1	1	7	4.43	1.162		.005	.603
	Transparency 2	1	7	4.53	1.214	3.202	-.201	.294
	Transparency 3	1	7	4.60	1.131		-.231	.941
Net Benefits	(Number of items = 7)			4.726	7.659			
	Better service quality 1	1	7	4.74	1.257		-.432	.633
	Good governance 2	1	7	4.59	1.227		-.419	.724
	High performance 3	1	7	4.83	1.224		-.509	.713
	Value for money 4	1	7	5.07	1.186	7.659	-.286	-.002
	Favorable services 5	1	7	4.87	1.256		-.621	.825
	Enhance participation 6	1	7	4.51	1.346		-.341	.245
	Transparent 7	1	7	4.47	1.346		-.553	.567
Use	(Number of items = 3)			5.048	3.705			
	Use 1	1	7	5.16	1.313		-.499	.081
	Use 2	1	7	4.89	1.399	3.705	-.540	.168
	Use 3	1	7	5.10	1.291		-.720	.778
User satisfaction	(Number of items = 1)	1	7	4.96	1.268		-.809	1.031

Note: Standard error of Skewness = 0.114, Kurtosis = 0.228

Source: Develop for this research

The recommended statistical value for skewness is < 2 (Castro, et al., 2010). Skewness of ±1 is recommended as an acceptable range (Noar, 2003). The skewness statistic of the main study is under 1 which is considered an acceptable value.

Kurtosis is a measure of the heaviness of the tails of a distribution. A normal distribution has kurtosis 0. Normal distributions will have kurtosis values close to 0. Absolute value of 0-2 is acceptable (Castro, et al., 2010; Noar, 2003). The kurtosis statistic of the main study is within the recommended value (±1).

The skewness and kurtosis statistics of the main study were well within a tolerable range for assuming a normal distribution.

4.5.5 Reliability analyses

Reliability is also known as internal consistency. Lewis, Templeton, and Byrd (2005) stated that reliability is the stability of a measure across different samples. Hair, Anderson, Tatham, and Black (1998) describe reliability as an assessment of the degree of consistency between multiple measurements of a variable. After the data screening procedure and the testing of the data distribution, the alpha statistics of items or reliability coefficient, indicators and constructs were extracted to determine reliability (Lewis, et al., 2005).

Cronbach's alpha is the most common and widely used statistic for reliability assessment in many research studies such as in marketing practices (Peter, 1979), management research (Brahma, 2009), scale development (Noar, 2003), customer relationship management (Roh, et al., 2005) including e-government assessment (Hooper, Coughlan, & Mullen, 2008; Wang & Liao, 2008; Wangpipatwong, et al., 2008).

The reliability scores for the constructs and items were measured by Cronbach's alpha. Cronbach's alpha value varies from 0-1 with value closes to 1 is acceptable. Lewis Bruce R Lewis, Gary F Templeton, and Terry Anthony Byrd (2005) suggested a cut-off for Cronbach's Alpha of 0.8. However, a cut-off of 0.7 is acceptable for an exploratory research study. Hair, Anderson, Tatham, and Black (1998) suggested that the generally agreed lower limited for Cronbach's alpha is 0.70.

Table 14 displays the values of Cronbach's alpha of each construct and its indicators ($N = 457$).

Table 14 Reliability Estimates for the main study

	Label	Mean	SD	Cronbach's alpha
Information Quality		**4.913**	**12.854**	**0.947**
Accuracy	ACR	5.179	2.227	0.865
Completeness	CPN	4.808	3.611	0.903
Relevance	REL	4.880	2.183	0.845
Security	SEC	4.990	2.109	0.742
Timeliness	TIME	4.820	2.717	0.901
Understandability	UND	4.830	2.420	0.908
System Quality		**4.968**	**14.682**	**0.956**
Dependability	DPN	4.845	2.390	0.940
Ease of use	EOU	4.837	2.275	0.777
Efficiency	EFF	5.113	2.210	0.782
Functionality	FUNC	4.923	2.234	0.752
System availability	SYA	4.780	2.386	0.801
Usability	USA	4.916	3.321	0.920
Usefulness	UFN	5.392	2.381	0.879
Service Quality		**4.238**	**16.138**	**0.975**
Assurance	ASU	4.406	4.354	0.933
Empathy	EMP	4.183	3.583	0.931
Reliability	REI	4.212	2.293	0.938
Responsiveness	RESP	4.058	3.736	0.945
Tangibility	TAN	4.268	3.469	0.863
Participation Quality		**4.607**	**11.201**	**0.936**
Access	ACC	4.986	2.160	0.786
Accountability	ACOU	4.700	2.300	0.895
Contestability	CTA	4.362	2.348	0.885
Equality	EQA	4.775	2.229	0.794
Openness	OPEN	4.342	2.379	0.885
Transparency	TPS	4.478	2.217	0.851

Source: Developed for this research

Cronbach's alpha of all indicators of the main study is 0.785 – 0.945 which lies within the suggested value (> 0.7). The alpha value of each construct was computed and the results stated that Cronbach's alpha of the constructs is above 0.9 (0.916-0.976), higher than the recommended value (> 0.7).

The Cronbach's alpha value of constructs and indicators in the main study indicated that internal consistency (reliability) exists at an acceptable level. All items can be applied in CFA and SEM to examine the properties of measurement.

4.6 Measurement properties

A two-step approach, CFA and SEM, is utilized to examine the measurement model and the structural model. In the first stage, the measurement model is estimated. Instrument validity is a crucial part prior to SEM analysis. The reliability and variance extracted for a latent construct must be computed separately for each multiple indicator construct in the model. The second stage, the measurement model is 'fixed' while the structural model is estimated. The reliability of the indicators is best achieved in two steps to avoid the interaction of measurement and structural models (Hair, et al., 1998).

The research model (Figure 10) comprises exogenous and endogenous constructs. The exogenous construct is the independent variable that acts as a predictor or cause for other constructs or variables in the model. In a path diagram, the exogenous construct contains only causal arrows leading out to other construct (Hair, et al., 1998). The exogenous constructs in the research model are Information Quality, System Quality, Service Quality, and Participation Quality. They are evaluated as the measurement models in SEM.

The endogenous construct is the dependent or outcome variable. Changing independent variables leads to different outcomes for the endogenous construct. In terms of a path diagram, one or more arrows lead into this construct (Hair, et al., 1998). The endogenous constructs in the research model are Use, User Satisfaction,

and Net Benefits. They are measured together with the measurement models in structural model analyses.

Before testing for a significant relationship of the structural model, the measurement model has to estimate a satisfaction level of reliability and validity (Fornell & Larcker, 1981). Factor analysis, reliability and validity assessment, and fit indices are applied to examine scale items as to whether they are appropriate to be employed in SEM (Hair, et al., 1998; Lewis, et al., 2005). A test of the measuring scales was computed and the results are displayed with the recommended or cut-off values. Statistical values displayed are the factor analysis, reliability, and validity results.

4.6.1 Fit Indices

CFA was applied to investigate the measurement models. Items and measures are purified to a multiple run of CFA with maximum likelihood estimation (Lewis, et al., 2005). Fit indices were estimated to find the good fit and to be compared with the recommended values in Table 15. There is no one-fit- index for all. Reporting only one fit index is not enough to endorse a good fit (Schreiber, Stage, & King, 2006). Shah and Goldstein (2006) recommended that reviewers and readers should have opportunities to assess the underlying fit of the data to the model from multiple perspectives (Iacobucci, 2010; Shah & Goldstein, 2006).

Fit indices normally reported in IS research studies are *p*-value, the ratio of chi-square to degree-of-freedom ($\chi 2$ / df), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), normalized fit index (NFI), comparative fit index (CFI), root mean square residual (RMR), Standardized RMR (SRMR), and root mean square error of approximation (RMSEA) (Hair, et al., 1998; Schreiber, et al., 2006;

Wang & Liao, 2008). Research should report multiple measures of fit until definite fit indices are developed so that reviewers and readers have the opportunity to evaluate the underlying fit of data from the initial analyses (Shah & Goldstein, 2006).

Table 15 The recommended statistical value of fit indices

Indexes		Recommended value	Reference
Absolute Fit Indices			
Significance level		$p > .05$	(Hair, et al., 1998)
The ratio of χ^2 to the degrees-of-freedom (Relative χ^2)	χ^2 / *df*	2-5 ≤ 3.00	(Hair, et al., 1998; Noar, 2003) (Schreiber, et al., 2006)
Goodness-of-fit index	**GFI**	≥ 0.9	(Hair, et al., 1998, p. 657; Hooper, et al., 2008)
Adjusted goodness-of-fit index	**AGFI**	≥ 0.9	(Hair, et al., 1998)
Root mean square residual	**RMR**	< 0.1	(Hair, et al., 1998)
Standardized RMR	**SRMR**	< 0.08 < 0.05	(Schreiber, et al., 2006) (Hooper, et al., 2008)
Root mean square error of approximation	**RMSEA**	< 0.08 0.05-0.08	(Schreiber, et al., 2006) (Hair, et al., 1998, p. 656)
Incremental Fit Indices			
Normalized fit index	**NFI**	≥ 0.9	(Hair, et al., 1998, p. 657)
Comparative fit index	**CFI**	≥ 0.9 ≥ 0.95	(Hair, et al., 1998) (Schreiber, et al., 2006)

Source: Developed for this research

The research model is composed of 4 measurement models: Information Quality, System Quality, Service Quality and Participation Quality. Results in each measurement model are shown in order as follows:

a) Information Quality

The initial estimation of the measurement model consist of 6 indicators: Accuracy (ACR), Completeness (CPN), Relevance (REI), Security (SEC), Timeliness

(TIME), and Understandability (UND). Number of items was 18. The result was a poor-fit. The adjustments were made in accordance with modification indices or the stand residuals (Hair, et al., 1998). The problematic items with low loading, cross-loading or freestanding were deleted. The model and fit indices were improved through a series of runs. The modified indicators in each run and evidence of model fit are presented in Table 16.

Table 16 CFA Fit Indices of Information Quality

CFA	Modified items	Evidence of model fit after item modifications
1st	None (run a latent variable with 18 items)	Chi-square = 849.572; df = 129; p = .000 Relative Chi-square = 6.586 GFI = .832; AGFI = .777; NFI = .889; CFI = .904; RMSEA = .111; RMR = .105; Standardized RMR = .0618
2nd	Add correlation error Completeness 1<->3, Security 1<->3, Security 2<->3, Understandability 1<->2; delete Timeliness 1 (run a latent variable with 17 items)	Chi-square = 609.633; df = 109; p = .000 Relative Chi-square = 5.593 GFI = .859; AGFI = .802; NFI = .915; CFI = .929; RMSEA = .1; RMR = .082; Standardized RMR = .0481
3rd	Delete Understandability 1 (run a latent variable with 16 items)	Chi-square = 516.21; df = 95; p = .000 Relative Chi-square = 5.434 GFI = .874; AGFI = .819; NFI = .924; CFI = .937; RMSEA = .099; RMR = .07; Standardized RMR = .0429
4th	Delete Security 2 (run a latent variable with 15 items)	Chi-square = 445.871; df = 83; p = .000 Relative Chi-square = 5.372 GFI = .884; AGFI = .832; NFI = .928; CFI = .941; RMSEA = .098; RMR = .06; Standardized RMR = .0370
5th	Delete Accuracy 1 (run a latent variable with 14 items)	Chi-square = 370.682; df = 70; p = .000 Relative Chi-square = 5.295 GFI = .895; AGFI = .843; NFI = .935; CFI = .947; RMSEA = .097; RMR = .059;Standardized RMR = .0360
6th	Delete Relevance 1 (run a latent variable with 13 items)	Chi-square = 303.826; df = 58; p = .000 Relative Chi-square = 5.238 GFI = .905; AGFI = .852; NFI = .94; CFI = .95; RMSEA = .096; RMR = .057; Standardized RMR = .0346
Model fit criteria: p > .05; GFI > .95, AGFI > .90; NFI > .90; CFI > .95; RMSEA < .08, RMR < .1, SRMR < .08		

Source: Developed for this research

Indicators with high standard residuals, cut-off at 2.5, (Anderson & Gerbing, 1988) or larger reductions of Chi-square were identified and eliminated one by one. Parameter estimates of the final model were investigated and fit indices were improved to acceptable thresholds (GFI = .905; AGFI = .852; NFI = .94; CFI = .95; RMSEA = .096; RMR = .057; Standardized RMR = .0346). Chi-square and degree of freedom were reduced (Chi-square = 303.826; df = 58).

The thirteen remaining items (ACR2, ACR3, CPN1, CPN2, CPN3, REI2, REI3, SEC1, SEC3, TIME2, TIME3, UND2, and UND3) further analyzed reliability and validity.

b) System Quality

The initial measurement model of Service Quality comprises 7 indicators; Dependability (DEP), Ease of use (EOU), Efficiency (EFF), Functionality (FUNC), System availability (SYA), Usability (USA), and Usefulness (UFN). Number of items was 24. The evidence of model fit did not fit well with the recommended value (Relative Chi-square = 8.523; GFI = .715; AGFI = .651; NFI = .817; CFI = .835; RMSEA = .128; RMR = .119; Standardized RMR = .0763). Chi-square and degree of freedom were very high (Chi-square = 2,088.081; df = 245) (see Table 17).

Table 17 CFA Fit Indices of System Quality

CFA	Modified items	Evidence of model fit after item modifications
1st	None (run a latent variable with 24 items)	Chi-square = 2,088.081; df = 245; p = .000 Relative Chi-square = 8.523 GFI = .715; AGFI = .651; NFI = .817; CFI = .835; RMSEA = .128; RMR = .119; Standardized RMR = .0763
2nd	Add correlation error Ease of use 1<->3, Efficiency 1<->3, Functionality 2<->3, Functionality 3<->4, Functionality 4<->5; (run a latent variable with 24 items)	Chi-square = 1,820.663; df = 240; p = .000 Relative Chi-square = 7.586 GFI = .747; AGFI = .684; NFI = .841; CFI = .858; RMSEA = .12; RMR = .103; Standardized RMR = .0660
3rd	Delete Efficiency 2, Functionality 3, Functionality 4, Functionality 5 (run a latent variable with 20 items)	Chi-square = 1,270.744; df = 162; p = .000 Relative Chi-square = 7.844 GFI = .784; AGFI = .72; NFI = .864; CFI = .879; RMSEA = .123; RMR = .099; Standardized RMR = .0649
4th	Delete Dependability 3, Usefulness 1 (run a latent variable with 18 items)	Chi-square = 839.183; df = 127; p = .000 Relative Chi-square = 6.608 GFI = .831; AGFI = .772; NFI = .896; CFI = .91; RMSEA = .111; RMR = .081; Standardized RMR = .05
5th	Delete Ease of use 2, Usefulness 4 (run a latent variable with 16 items)	Chi-square = 715.107; df = 97; p = .000 Relative Chi-square = 7.372 GFI = .835; AGFI = .769; NFI = .899; CFI = .911; RMSEA = .118; RMR = .066; Standardized RMR = .0424
6th	Delete Usability 1 (run a latent variable with 15 items)	Chi-square = 584.581; df = 83; p = .000 Relative Chi-square = 7.043 GFI = .854; AGFI = .788; NFI = .908; CFI = .92; RMSEA = .115; RMR = .064; Standardized RMR = .0411
Model fit criteria: p > .05; GFI > .95, AGFI > .90; NFI > .90; CFI > .95; RMSEA < .08, RMR < .1, SRMR < .08		

Source: Developed for this research

The modification indices in each run suggested deleting EFF2, FUNC3, FUNC4, FUNC5, DPN 3, UFN1, EOU2, UFN4, and USA1 consecutively. Parameter estimation of the final model was examined and the results were better. Chi-square and degree of freedom improved (Chi-square = 584.581; df = 83). Fit indices (GFI = .854; AGFI = .788; NFI = .908; CFI = .92; RMSEA = .115; RMR = .064; Standardized RMR = .0411) were better compared with the initial estimation. The fifteen remaining items (DPN1, DPN2, EOU1, EOU3, EFF1, EFF3, FUNC1, FUNC2,

SYA1, SYA2, SYA3, USA2, USA3, UFN2, and UFN3) were computed in terms of reliability and validity in the next step.

c) Service Quality

The initial measurement model of Service Quality comprises 5 indicators: Assurance (ASR), Empathy (EMP), Reliability (REI), Responsiveness (RESP), and Tangibility (TAN). The number of items is 16. A series of CFAs were performed and the results are displayed in Table 18.

Table 18 CFA Fit Indices of Service Quality

CFA	Modified items	Evidence of model fit after item modifications
1st	None (run a latent variable with 16 items)	Chi-square = 1,236.979; df = 99; p = .000 Relative Chi-square = 12.495 GFI = .767; AGFI = .68; NFI = .875; CFI = .884; RMSEA = .159; RMR = .076; Standardized RMR = .052
2nd	Add correlation error Assurance 1<->2, Assurance 2<->4, Assurance 1<->4, Responsiveness 1<->3, Tangibility 1<->3 (run a latent variable with 16 items)	Chi-square = 643.538; df = 94; p = .000 Relative Chi-square = 6.846 GFI = .853; AGFI = .787; NFI = .935; CFI = .944; RMSEA = .113; RMR = .065; Standardized RMR = .0434
3rd	Delete Reliability 1 (run a latent variable with 15 items)	Chi-square = 546.090; df = 80; p = .000 Relative Chi-square = 6.826 GFI = .869; AGFI = .804; NFI = .942; CFI = .95; RMSEA = .113; RMR = .062; Standardized RMR = .0407
Model fit criteria: p > .05; GFI > .95, AGFI > .90; NFI > .90; CFI > .95; RMSEA < .08, RMR < .1, SRMR < .08		

Source: Developed for this research

Parameter estimation of the initial model was a poor-fit (GFI = .767; AGFI = .68; NFI = .875; CFI = .884; RMSEA = .159; RMR = .076; Standardized RMR = .052) with a high Chi-square and degree of freedom (Chi-square = 1,236.979; df = 99). The modification indices recommended deleting one problematic item, REI1. Parameter estimation of the final of model was determined and values were improved.

The fifteen remaining items with 5 indicators were further analyzed for reliability and validity.

d) Participation Quality

The initial measurement of Participation Quality consists of 6 indicators: Access (ACC), Accountability (ACOU), Contestability (CTA), Equality (EQA), Openness (OPEN), and Transparency (TPS). Number of items is 20. Table 19 shows the results of the CFA multiple run with evidence of fit indices for each run.

Table 19 CFA Fit Indices of Participation Quality

CFA	Modified items	Evidence of model fit after item modifications
1st	None (run a latent variable with 20 items)	Chi-square = 1,484.540; df = 164; p = .000 Relative Chi-square = 9.052 GFI = .743; AGFI = .671; NFI = .838; CFI = .853; RMSEA = .133; RMR = .141; Standardized RMR = .0981
2nd	Add correlation error Access 1<->2; delete Equality 2 and Openness 1 (run a latent variable with 18 items)	Chi-square = 1,034.209; df = 128; p = .000 Relative Chi-square = 8.08 GFI = .803; AGFI = .737; NFI = .872; CFI = .886; RMSEA = .125; RMR = .13; Standardized RMR = .0905
3rd	Delete Accountability 1 and Transparency 3 (run a latent variable with 16 items)	Chi-square = 753.851; df = 97; p = .000 Relative Chi-square = 7.772 GFI = .825; AGFI = .755; NFI = .888; CFI = .901; RMSEA = .122; RMR = .123; Standardized RMR = .0839
4th	Delete Access 2 and Contestability 2 (run a latent variable with 14 items)	Chi-square = 604.920; df = 71; p = .000 Relative Chi-square = 8.52 GFI = .835; AGFI = .756; NFI = .891; CFI = .902; RMSEA = .128; RMR = .119; Standardized RMR = .0812
5th	Delete Access 4 (run a latent variable with 13 items)	Chi-square = 527.559; df = 59; p = .000 Relative Chi-square = 8.772 GFI = .841; AGFI = .755; NFI = .894; CFI = .905; RMSEA = .131; RMR = .091; Standardized RMR = .0627
6th	Delete Equality 1 (run a latent variable with 12 items)	Chi-square = 403.888; df = 48; p = .000 Relative Chi-square = 8.414 GFI = .866; AGFI = .782; NFI = .909; CFI = .919; RMSEA = .128; RMR = .084; Standardized RMR = .0577
Model fit criteria: p > .05; GFI > .95, AGFI > .90; NFI > .90; CFI > .95; RMSEA < .08, RMR < .1, SRMR < .08		

Source: Developed for this research

The first CFA analysis yielded poor-fit indices (GFI = .743; AGFI = .671; NFI = .838; CFI = .853; RMSEA = .133; RMR = .141; Standardized RMR = .0981) with high Chi-square and degree of freedom (Chi-square = 1,484.540; df = 164). The modification indices advised the removal of the following items: EQA2, OPEN1, ACOU1, TPS3, ACC2, CTA2, ACC4, and EQA1.

Parameter estimates were computed in each modification. Fit indices of the model were improved through the series of CFA analyses and adjustments in accordance with the modification indices (Hair, et al., 1998). The evidence of final model fits was GFI = .866; AGFI = .782; NFI = .909; CFI = .919; RMSEA = .128; RMR = .084; Standardized RMR = .0577. Chi-square and degree of freedom decreased to 527.559 and 59 respectively. The remaining items (12) (ACC1, ACC3, ACOU2, ACOU3, CTA1, CTA3, EQA3, EQA4, OPEN2, OPEN3, TPS1, and TPS2) were employed in the further step to analyze reliability and validity.

Comparison of all fit indices with their corresponding recommended values provided evidence of a good model fit. The number of items was reduced from 89 to 66 items. It is important that the newly developed scales evaluate reliability and validity (Anderson & Gerbing, 1988; MacKenzie, Podsakoff, & Podsakoff, 2011). Items in the re-specified measurement models were examined prior to the determination of path coefficients of the structural model.

4.6.2 Factor Analyses

Factor analysis is employed to examine items, and the extraction method was Principle Component Analysis. The factor loading value of items was loaded mostly in one factor. Varimax rotation was not applicable for these items. The 'unrotated' solution was applied. Hair, Anderson, Thatham, and Black (1998) stated

that each measure loads on one and only one factor which implies no double loadings.

Hair, Anderson, Tatham, and Black (1998) suggested that factor loadings greater than ±.30 are considered to meet the minimal level; loadings of ±.40 are considered more important; and if the loadings are ±.50 or greater (Straub & Carison, 1989), they are considered practically significant. Straub and Carison (1989) suggested a factor loading threshold for exploratory assessment at 0.5 (Straub & Carison, 1989). Items with lower values should be dropped from further analysis (Lewis, et al., 2005).

Factor analysis results of Information Quality, System Quality, Service Quality, and Participation Quality constructs are displayed in Table 20, 21, 22 and 23 consecutively.

Table 20 Factor analysis results of Information Quality construct

Item Description	(Number of items = 13)	Label	Factor loading
The website provides truthful information.	Accuracy 2	ACR2	0.740
I am satisfied with the accuracy of information presented on the website.	Accuracy 3	ACR3	0.766
The website enables me to access adequate information.	Completeness 1	CPN1	0.856
I find information on the website is sufficient for the task at hand.	Completeness 2	CPN2	0.852
Information on the website is complete.	Completeness 3	CPN3	0.791
The website enables me to find information that I need.	Relevance 2	REL2	0.821
Information on the website relates to my requirements.	Relevance 3	REL3	0.814
I am confident about the security of the website.	Security 1	SEC1	0.707
I feel that the administrators will not misuse my personal information.	Security 3	SEC3	0.641
Using this website enables me to access up-to-date information compared to other sources.	Timeliness 2	TIME2	0.760
Using this website enables me to access the latest information.	Timeliness 3	TIME3	0.766
Information on the website is clear.	Understandability 2	UND2	0.859
Information on the website is easy to understand.	Understandability 3	UND3	0.793

Source: Developed for this research

Considering Table 20, factor loadings of items in the final model of CFA Information Quality were well-above the cut-off (0.5, Hair, et al., 1998; Lewis, et al., 2005). The minimum value is 0.641 (SEC3) and the maximum value is 0.859 (UND2).

Table 21 displays the factor loadings of items in the final model of CFA System Quality. All items obtained higher values of factor loading (cut-off 0.5, Hair, et al., 1998; Lewis, et al., 2005). The minimum value is 0.635 (UFN2) and the maximum value is 0.849 (USA2).

Table 21 Factor analysis results of System Quality construct

Item Description	(Number of items = 15)	Label	Factor loading
The website always performs well when I access it.	Dependability 1	DPN1	0.839
The website is available every time I request it.	Dependability 2	DPN2	0.841
I can easily log-in to the website.	Ease of use 1	EOU1	0.782
The navigation of this website is easy to follow.	Ease of use 3	EOU3	0.800
Gaining access to the website is easy.	Efficiency 1	EFF1	0.836
Using the website has improved my work productivity by saving time.	Efficiency 3	EFF3	0.791
The website always works correctly.	Functionality 1	FUNC1	0.807
The website provides necessary information for downloading.	Functionality 2	FUNC2	0.698
The website launches immediately.	System availability 2	SYA2	0.833
The website does not crash.	System availability 3	SYA3	0.775
I find the website is user-friendly.	Usability 1	USA1	0.857
Finding my way to this website is easy.	Usability 2	USA2	0.849
The website is easy to navigate both forwards and backwards.	Usability 3	USA3	0.829
Using the website helps me to reduce travelling expenses.	Usefulness 2	UFN2	0.635
Using the website can lower queuing time.	Usefulness 3	UFN3	0.669

Source: Developed for this research

Considering Table 22, the factor loadings of items in the final model of CFA Service Quality were well-above the cut-off (0.5, Hair, et al., 1998; Lewis, et al., 2005). The minimum value is 0.705 (TAN3) and the maximum value is 0.896 (TAN1 and TAN2).

Table 22 Factor analysis results of Service Quality construct

Item Description	(Number of items = 15)	Label	Factor loadings
Government staff members provide perfect responses to convey trust to citizens.	Assurance 1	ASU1	0.762
Government staff members provide perfect responses to convey confidence to citizens.	Assurance 2	ASU2	0.791
The government staff members seem to have sufficient knowledge to answer my questions.	Assurance 3	ASU3	0.859
The government staff members seem to have the ability to solve my problem.	Assurance 4	ASU4	0.891
Government staff members respond to my requests in a timely fashion.	Empathy 1	EMP1	0.875
If I send a request via email or web board to the government, I will receive a response from government staff that shows a willingness to help.	Empathy 2	EMP2	0.890
If I send a request via email or web board to the government, I will receive a response that shows the friendliness of government staff.	Empathy 3	EMP3	0.890
If I send a request via email or web board, I will receive the right solution from government staff.	Reliability 2	REI2	0.907
If I send a request via email or web board, I will receive the right solution that matches my needs from government staff.	Reliability 3	REI3	0.894
If I send a request via email or web board, I will receive a prompt response from the government officials.	Responsiveness 1	RESP1	0.885
If I have a problem with the websites, a government staff member quickly resolves my problems.	Responsiveness 2	RESP2	0.900
Government staff members are keen to help all website users.	Responsiveness 3	RESP3	0.894
If I need help, I can find a way to reach a government staff member such as by email or web board on the websites.	Tangibility 1	TAN1	0.896
There is a staff member who responds to my request.	Tangibility 2	TAN2	0.896
The website uses the latest technology.	Tangibility 3	TAN3	0.705

Source: Developed for this research

Table 23 displays the factor loadings of items in the final model of CFA Participation Quality. All items obtained higher values of factor loading (cut-off 0.5,

Hair, et al., 1998; Lewis, et al., 2005). The minimum value is 0.705 (TAN3) and the maximum value is 0.907 (REI2).

Table 23 Factor analysis results of Participation Quality construct

Item Description	(Number of items = 12	Label	Factor loading
The information on the website meets my needs.	Access 1	ACC1	0.555
The website is accessible from anywhere.	Access 3	ACC3	0.491
My personal information is well-protected.	Accountability 2	ACOU2	0.799
I am certain that personal information I submit through the website will be used properly by authorized persons.	Accountability 3	ACOU3	0.821
This website makes it easy for me to discuss issues with other users or government staff.	Contestability 1	CTA1	0.874
I feel that I am free to say anything.	Contestability 3	CTA3	0.828
I have the right to enter all government websites.	Equality 3	EQA3	0.742
I feel that I can exercise my civic obligations through the website.	Equality 4	EQA4	0.788
This website provides tools for me to input my ideas and opinions.	Openness 2	OPEN2	0.855
I can share my experience and expertise on government projects and policy-making processes.	Openness 3	OPEN3	0.799
Rules that are related to user comments are clearly stated on the websites such as offensive comments or bad language.	Transparency 1	TPS1	0.813
Rules are easy to find on the website.	Transparency 2	TPS2	0.810

Source: Developed for this research

The factor loading of items of the re-specified measurement models were well above 0.5. The minimum value was .491 (ACC3). The value is slightly below the cut-off value (.009), however, ACC3 is kept for further analysis. The maximum value was .874 (CTA1). The other items attained convergence as the factor-loading threshold was higher than the recommended value (0.5) and can be further analyses of reliability and validity.

AVE indicates "the total amount of variance in the indicators is accounted for by the latent variable" (Brahma, 2009). It is a norm to report the AVE of a latent construct as a supplementary measure of construct validity (Garver & Mentzer, 1999). AVE measures the relations of the amount of variance captured by constructs and the variance due to measurement error and the formula is (summation of squared factor loadings)/{(summation of squared factor loadings)+(summation of error variances)} (Fornell & Larcker, 1981). Error variance is derived from 1-item reliability, also known as delta. The cut-off value of AVE is 0.50 (Chau, 1997; Fornell & Larcker, 1981).

Composite (construct) reliability (CR) refers to a higher level of internal consistency of the indicators measuring a given factor. Generally 0.7 is the acceptable criterion. The formula is as follows: (square of summation of factor loadings) / {(square of summation of factor loading) + (summation of error variances)} (Fornell & Larcker, 1981). Tables 24, 25, 26, and 27 displays the validity analysis results of the items in the re-specifying measurement models.

Table 24 displays a summary of the reliability and validity of Information Quality. Factor loading of all items exceed the cut-off (0.5, Lewis, et al., 2005). The minimum value is 0.641 and the maximum is 0.859. Item reliability or R^2's cut-off value is 0.5 (Fornell & Larcker, 1981). The minimum R^2 is 0.410 (SEC3) which is slightly below (0.09) the cut-off, however, the one-item per an indicator is not recommended. SEC3 is kept for further analysis. Item reliability of other items is higher than the cut-off.

Table 24 Summary of reliability and validity analysis of Information Quality

	Label	Factor loading	Item reliability	AVE	CR
(Number of items = 13)				*Eigenvalue =7.998*	
Accuracy 2	ACR2	.740	.548	0.568	0.724
Accuracy 3	ACR3	.766	.587		
Completeness 1	CPN1	.856	.733	0.717	0.880
Completeness 2	CPN2	.852	.726		
Completeness 3	CPN3	.791	.691		
Relevance 2	REL2	.821	.674	0.668	0.801
Relevance 3	REL3	.814	.662		
Security 1	SEC1	.707	.500	0.455	0.625
Security 3	SEC3	.641	.410		
Timeliness 2	TIME2	.760	.578	0.582	0.736
Timeliness 3	TIME3	.766	.586		
Understandability 2	UND2	.859	.738	0.684	0.812
Understandability 3	UND3	.793	.629		

Source: Developed for this research

The AVE of each indicator was computed and the results were higher than the recommended value at 0.5 (Lewis, et al., 2005; Straub & Carison, 1989) except the Security indicator which is slightly below (.045) the cut-off. However, the one-item per an indicator is not recommended (Hair, et al., 1998). To maintain the intended meaning of the construct, the Security indicator is kept and employed in the assessment of a structural model. CR, however, almost all indicators obtained a higher value than the cut-off (0.7, Fornell & Larcker, 1981). Considering factor loading of SEC1 and SEC3, 0.707 and 0.641, are higher than the cut-off (0.5, Lewis, et al., 2005).

Table 25 exhibits a summary of the reliability and validity of the items of the re-specifying System Quality construct.

Table 25 Summary of reliability and validity analysis of System Quality

	Label	Factor loading	Item reliability	AVE	CR
(Number of items = 15)				*Eigenvalue = 9.416*	
Dependability 1	DPN1	0.839	0.839	0.840	0.898
Dependability 2	DPN2	0.841	0.841		
Ease of use 1	EOU1	0.782	0.646	0.648	0.780
Ease of use 3	EOU3	0.800	0.649		
Efficiency 1	EFF1	0.836	0.712	0.686	0.808
Efficiency 3	EFF3	0.791	0.660		
Functionality 1	FUNC1	0.807	0.654	0.573	0.726
Functionality 2	FUNC2	0.698	0.491		
System availability 2	SYA2	0.833	0.699	0.678	0.801
System availability 3	SYA3	0.775	0.657		
Usability 1	USA1	0.857	0.742	0.720	0.884
Usability 2	USA2	0.849	0.723		
Usability 3	USA3	0.829	0.695		
Usefulness 2	UFN2	0.635	0.856	0.845	0.845
Usefulness 3	UFN3	0.669	0.833		

Source: Developed for this research

All factor loading values are higher than the recommended cut-off (0.5, Lewis, et al., 2005). Considering item reliability, items obtained a better value than the cut-off (0.5, Fornell & Larcker, 1981). The minimum item reliability is 0.491 (FUNC2), slightly below the recommended value (.009). However, the one-item per an indicator is not recommended (Hair, et al., 1998). To maintain the intended meaning of the construct, FUNC2 will be applied in the next step. The maximum is 0.856 (UFN2).

The recommend value for AVE is 0.5 (Lewis, et al., 2005; Straub & Carison, 1989). All indicators of System Quality displayed a higher value than 0.5 with a minimum of 0.573 and a maximum of 0.845). CR value is calculated and the results ranged from 0.726 (Functionality) to 0.989 (Dependability). The acceptable

value of CR is 0.7 (Fornell & Larcker, 1981). All indicators hold high values of CR. Items and indicators of System Quality possess convergent validity.

A summary of reliability and validity analysis of Service Quality is shown in Table 26.

Table 26 Summary of reliability and validity analysis of Service Quality

	Label	Factor loadings	Item reliability	AVE	CR
(Number of items = 15)				*Eigenvalue = 11.206*	
Assurance 1	ASU1	.762	.882	0.850	0.948
Assurance 2	ASU2	.791	.908		
Assurance 3	ASU3	.859	.794		
Assurance 4	ASU4	.891	.814		
Empathy 1	EMP1	.875	.781	0.789	0.918
Empathy 2	EMP2	.890	.794		
Empathy 3	EMP3	.890	.792		
Reliability 2	REI2	.907	.844	0.834	0.907
Reliability 3	REI3	.894	.824		
Responsiveness 1	RESP1	.885	.823	0.860	0.945
Responsiveness 2	RESP2	.900	.890		
Responsiveness 3	RESP3	.894	.866		
Tangibility 1	TAN1	.896	.854	0.738	0.888
Tangibility 2	TAN2	.896	.848		
Tangibility 3	TAN3	.705	.513		

Source: Developed for this research

Factor loading of all items are larger than the cut-off (0.5, Lewis, et al., 2005) with a minimum value of 0.705 (TAN3) and a maximum of 0.907 (REI2). Item reliability indicated a higher value than the recommended cut-off (0.5, Fornell & Larcker, 1981) and can be used to compute the CR value. Each construct is required to have an AVE greater than 0.5 (Lewis, et al., 2005; Straub & Carison, 1989). The AVE of constructs ranges from 0.738 (Tangibility) to 0.860 (Responsiveness).

Regarding CR, the minimum value is 0.888 (Tangibility) and the maximum is 0.948 (Assurance). CR of all indicators is larger than cut-off (0.7, Fornell & Larcker, 1981). Items and indictors of Service Quality had convergent validity.

Table 27 displays a summary of the reliability and validity of items in the re-specifying Participation Quality.

Table 27 Summary of reliability and validity analysis of Participation Quality

	Label	Factor loading	Item reliability	AVE	CR
(Number of items = 12)				*Eigenvalue = 7.169*	
Access 1	ACC1	0.555	0.698	0.743	0.680
Access 3	ACC3	0.491	0.787		
Accountability 2	ACOU2	0.799	0.673	0.707	0.817
Accountability 3	ACOU3	0.821	0.741		
Contestability 1	CTA1	0.874	0.765	0.737	0.846
Contestability 3	CTA3	0.828	0.709		
Equality 3	EQA3	0.742	0.552	0.578	0.739
Equality 4	EQA4	0.788	0.622		
Openness 2	OPEN2	0.855	0.807	0.784	0.864
Openness 3	OPEN3	0.799	0.761		
Transparency 1	TPS1	0.813	0.727	0.485	0.828
Transparency 2	TPS2	0.810	0.727		

Source: Developed for this research

The factor loading of items is higher than the cut-off (0.5, Lewis, et al., 2005) except ACC3, which is slightly below (.009) the cut-off. However, the one-item per an indicator is not recommended (Hair, et al., 1998). To maintain the intended meaning of the construct, ACC2 is kept for further analysis. Item reliability of all items indicated a better value than the cut-off (0.5, Fornell & Larcker, 1981). The minimum item reliability is 0.552 (EQA3) and the maximum is 0.807 (OPEN2).

Calculation of AVE for indicators showed that the highest value is 0.784 (Openness) which is higher than the cut-off (0.5, Lewis, et al., 2005; Straub & Carison, 1989). Other indicators also obtained better AVE values except Transparency (0.485) which is slightly below (.015) the cut-off. It is kept for further analysis. Considering CR, the minimum value is 0.680 (Access) and the maximum is 0.864 (Openness). The CR values of all indicators are higher than the recommended value (0.7, Fornell & Larcker, 1981).

Items and indicators of the re-specifying measurement models have acceptable valued for factor loadings, item reliability, AVE, and CR. Some items have a slightly below the recommended value. The one-item per an indicator is not recommended (Hair, et al., 1998). These items are kept for further analysis to maintain the meaning of the construct. The results indicate that convergent validity is evident. Items and indicators can be used to examine discriminant validity.

b) Discriminant Validity

Discriminant validity refers to the extent to which two conceptually similar concepts are distinct (Lewis, et al., 2005). If items are not associated with the construct, the items or constructs should discriminate among themselves and discriminant validity exists. Fornell and Larcker (1981) recommended two examination methods for discriminant validity; (1) considering correlations of scale items and (2) comparing the square root of the AVE and inter-construct correlations (Fornell & Larcker, 1981; Peter, 1981).

(1) The correlation matrix of items was examined to ensure that the data matrix has sufficient correlations. The results of the correlation matrix of each construct are shown in Appendix I. If items of each construct show high correlation

values among them, higher than the value of items of other constructs, the correlations within the constructs appear, and they are less likely to be related to other constructs. Then discriminant validity is obtained (Brahma, 2009).

In Appendix I, the correlation values of items within an indicator are higher than the values of items of other constructs in the same column and row. An item is related to other items of the same indicator, but not different indicators. However, there are a few items which the values of other constructs are higher, Tangibility 3 (Service Quality), High performance, Favorable services, Enhance Participation, and Transparent (Net Benefits). The value of these items showed low discriminant validity and they should be reviewed in the future study. Hence, the results of other items indicated that discriminant validity exists.

(2) Table 28 displays the correlations of constructs, AVE, and the square root of AVE.

Table 28 Correlations and AVE

	AVE	IQ	SQ	SV	PQ
Information Quality (IQ)	0.612	**0.782**			
System Quality (SQ)	0.713	0.686	**0.844**		
Service Quality (SV)	0.814	0.442	0.449	**0.902**	
Participation Quality (PQ)	0.674	0.489	0.598	0.590	**0.821**

The diagonal elements (in bold) = the square root of the AVE.
The off-diagonal elements = the correlations among constructs.

Source: Developed for this research

The square root of the AVEs of constructs was calculated and displayed in diagonal elements (in bold). The correlations of constructs were shown in the off-

diagonal elements. To obtain discriminant validity, the diagonal elements (the square root of the AVE) should be larger than the off-diagonal elements (the correlations among constructs). The values of the square root AVE of IQ, SQ, SV and PQ are larger than the correlations of constructs, thus the correlations among constructs are not significant. Constructs are not related to one another. The results indicated that each construct is discriminated from others and discrimination validity exists.

In this step, the reliability, convergent validity, and discriminant validity of items and indicators are investigated to ensure they are able to be applied in structural model testing (Hair, et al., 1998; Lewis, et al., 2005). The measurement models and items have shown adequate justification to the application of confirmatory factor analysis.

4.7 Structural Model and Hypothesis Testing

In the second stage, the structural model is estimated and the four measurement models are fixed. The reliability and validity of the re-specifying measurement models were examined, and path analysis was conducted. The structural model consists of 7 constructs: Information Quality, System Quality, Service Quality, Participation Quality, Use, User Satisfaction, and Net Benefits. The path links of twelve hypotheses including fit indices were examined using AMOS, an add-on of SPSS software.

The results of the structural model analyses are displayed in Figure 11.

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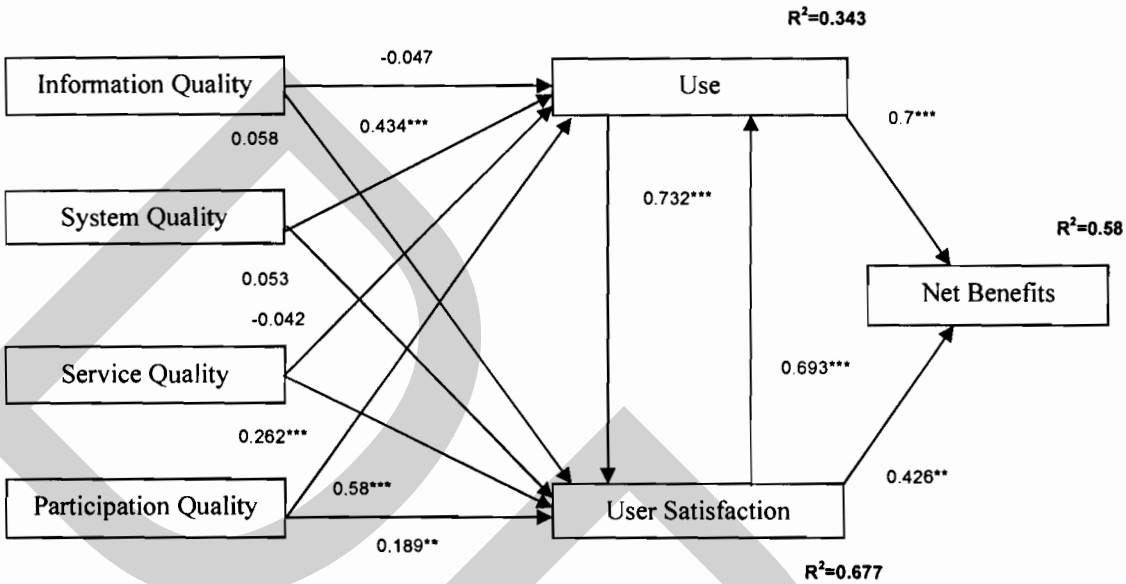
The results of the structural model analyses are displayed in Figure 11.



Significant: ** Significant at $p < 0.05$; *** at $p < 0.01$

Chi-square = 5.288; df = 2; $p = .071$
Relative Chi-square = 2.644
GFI = .997; AGFI = .954; NFI = .998; CFI = .999;
RMSEA = .06; RMR = .06; Standardized RMR = .0081

Model fit criteria:
$p > .05$; GFI > .95, AGFI > .90; NFI > .90; CFI > .95; RMSEA < .08, RMR < .1, SRMR < .08

Figure 11 Results of the structural model analyses

Source: Developed for this research

The overall model fit is in the acceptable threshold Chi-square (5.288) and the degree of freedom (2) is Relative Chi-square is 2.64 within the recommended value (2-5, Hair, et al., 1998; Noar, 2003). The relative Chi-square (2.644) was within the recommended range (2-5, Hair, et al., 1998; Noar, 2003). Values of absolute fit indices (GFI = .997; AGFI = .954; RMSEA = .06; RMR = .06; Standardized RMR = .0081) are in the suggested cut-off (GFI > .95, AGFI > .90; RMSEA < .08, RMR < .1, SRMR < .08). Values of incremental fit indices (NFI = .998; CFI = .999) are within

the recommended value (NFI = .998; CFI = .999). The results indicate that the re-specifying model has an acceptable model fit.

Path coefficient estimates, significance, and variances (R^2) were computed for hypotheses links and the results are displayed in Table 29. Regarding the constructs explained in the variance (R^2), the Use is 34.3%, the User Satisfaction is 67.7%, and the Net Benefits is 58%. Relationships of constructs and the influences among constructs are as follows:

Table 29 Path analysis results

Hypotheses	Path links	Standardized Estimate	Remark
H1a	Information Quality → Use	-0.047	Non-significant
H1b	Information Quality → User Satisfaction	0.058	Non-significant
H2a	System Quality → Use	0.434***	
H2b	System Quality → User Satisfaction	0.053	Non-significant
H3a	Service Quality → Use	-0.042	
H3b	Service Quality → User Satisfaction	0.262***	Non-significant
H4a	Participation Quality → Use	0.58***	
H4b	Participation Quality → User Satisfaction	0.189**	
H5a	Use → User Satisfaction	0.732***	
H5b	Use → Net Benefits	0.7***	
H6a	User Satisfaction → Use	0.693***	
H6b	User Satisfaction → Net Benefits	0.426**	
	R^2 Use	0.343	
	R^2 User Satisfaction	0.677	
	R^2 Net Benefits	0.580	

Significant level: * $p < 0.1$, ** $p < 0.05$; *** $p < 0.01$

Source: Developed for this research

a) Influences of Information Quality

H1a and H1b were hypothesized for Information Quality. **H1a** states that "Information Quality is positively associated with the use of e-government service delivery". A negative significant of path coefficient (-0.047) was observed for the path linked from Information Quality to Use. So the higher the quality of information, the lower the use of e-government service delivery is found.

H1b was established between Information Quality and User Satisfaction. The hypothesis stated that "Information Quality is positively associated with the User Satisfaction of e-government service delivery". The positive path coefficient (0.058) was detected. However, a non-significant path estimate was detected for both links from Information Quality to Use and to User Satisfaction.

b) Influences of System Quality

H2a and H2b were theorized for Service Quality. **H2a** states that System Quality is positively associated with the use of e-government service delivery. The result shows that the positive path coefficient is 0.434 with a significance level at $p < 0.01$. Thus, users perceived that a better System Quality leads to usage of e-government service delivery. The quality of the system is associated with several characteristics, for example, high efficiency, easy to use, availability of system when needed, and usefulness.

H2b illustrates that System Quality is positively associated with the User Satisfaction of e-government service delivery. A positive path coefficient is 0.053 with a significance level at $p < 0.1$. High system quality is able to increase the level of user satisfaction of e-government service delivery. However, a non-significant path estimate was detected for the link between System Quality and User Satisfaction.

c) Influences of Service Quality

H3a and H3b were created for Service Quality. **H3a** states that Service Quality is positively associated with the use of e-government service delivery. A negatively significant path coefficient (-0.04) was observed for the path linking Service Quality to Use. Changes in quality of services do not increase the amount of use, as users do not recognize the importance of System Quality. A non-significant path estimate was detected.

H3b hypothesized that Service Quality is positively associated with the User Satisfaction of e-government service delivery. A positive path estimate is shown (0.262) with significance level at $p < 0.1$. Users noticed that a high quality of services support their satisfaction in e-government service delivery. Elements of service quality include assurance, empathy towards users, reliable services, and response to users' needs.

d) Influences of Participation Quality

H4a states that Participation Quality is positively associated with the Use of e-government service delivery. A positive path estimate is shown (0.58) with a significance level at $p < 0.1$. The result indicates that users focus on the quality of their input involvements in government works. They are willing to participate and interact with their government through e-government service delivery.

H4b said that Participation Quality is positively associated with the User Satisfaction of e-government service delivery. A positive path estimate is shown (0.189) with a significance level at $p < 0.5$. The level of satisfaction can be amplified by increasing the quality of participation. Enhancing participation involves

accessibility, the accountability of the government, efficiency, the availability of the system, usability and the usefulness of e-government service delivery.

e) Influences of Use

H5a and H5b were established for the Use construct. **H5a** posited that use is positively associated with the User Satisfaction of e-government service delivery. Use can raise the level of user satisfaction. A positive path estimate is shown (0.732) with a significance level at $p < 0.01$. The path estimate of Use to User Satisfaction obtained the highest estimate in this re-specifying research model. Users realized that using e-government service delivery leads to satisfaction.

H5b mentioned that Use is positively associated with the Net Benefits of e-government service delivery. Users perceived that the more they use e-government service delivery, the more benefits they gain. A positive path estimate is shown (0.7) with a significance level at $p < 0.01$. Users also realized that more benefits are obtained by using e-government service delivery. The relationships between Use to User Satisfaction and Use to Net Benefits indicated that Use is the most important element and the consequence of use increases the advantages and benefits to users.

f) Influences of User Satisfaction

H6a and H6b were hypothesized for User Satisfaction. **H6a** states that User Satisfaction is positively associated with the Use of e-government service delivery while **H6b** mentioned that User Satisfaction is positively associated with the Net Benefits of e-government service delivery. Two positive path estimates are shown o the link from User Satisfaction to Use (0.693 with significance levels at $p < 0.01$) and User Satisfaction to Use (0.426 with a significance level at $p < 0.05$).

At the path analysis step, nomological validity is established through the examination of the strength of relationships between constructs if the relationships are associated with a theoretical model and concept (Lewis, et al., 2005). Nomological validity is examined as part of construct validity (Straub & Carison, 1989). At the end of this construct development process, construct validity is obtained from theoretical conceptualization, a selection research framework and model, the measurement of item and construct properties, and the analysis the path coefficient and relationships of the constructs.

4.8 Research Findings

The results showed that the measurement instrument that results from the research model can be applied to evaluate e-government service delivery. The extension of the D&M IS Success Model 2003 enables the instrument to cover the array of government services and evaluate the quality of citizen participation from a citizen's perspective. The proposed model fit (Chi-square = 5.288; df = 2; p = .071; Relative Chi-square = 2.644; GFI = .997; AGFI = .954; NFI = .998; CFI = .999; RMSEA = .06; RMR = .06; Standardized RMR = .0081) is within the recommended value (p > .05; GFI > .95, AGFI > .90; NFI > .90; CFI > .95; RMSEA < .08, RMR < .1, SRMR < .08). See Figure 11. The research model is a good fit to the observed data.

The findings suggested that Participation Quality was one of the measures in e-government service delivery. The results showed a positive relationship with Use (0.58, p < 0.01) and User satisfaction (0.189, p < 0.05). Users recognized that their involvement and inputs can facilitate the improvement of the government. If the

quality of participation increases, users tend to use more e-government services and their level of satisfaction increases. Influences of Participation quality are access, accountability, contestability, equality, openness, and transparency.

Parameter estimates of other variables were examined. Another positive relationships with significant path estimates is the relationships between System Quality to Use (0.434, $p < 0.01$). Users realized that System Quality is the critical factors that enhance their use. Key indicators for System Quality are dependability, ease of use, efficiency, functionality, system availability, usability, and usefulness.

Two path estimates indicated negative relationships between constructs: Information Quality to Use (-0.047, non-significant), and Service Quality to Use (-0.042, $p < 0.1$). The negative relationship means each construct is linked with a reverse effect. If the quality of information is high, users employ less e-government service delivery. But if a lesser amount of information is displayed, users tend to use it more.

There are four non-significant relationship; Information Quality to Use (-0.247, $p < 0.1$), Information Quality to User Satisfaction (0.058, $p < 0.1$), System Quality to User Satisfaction (0.053, $p < 0.1$), and Service Quality to User Satisfaction (0.262, $p < 0.01$). The significant relationship between the observed variables are System Quality to Use (0.434, $p < 0.01$), Service Quality to Use (-0.042, $p < 0.1$), Participation Quality to Use (0.58, $p < 0.01$), and Participation Quality to User Satisfaction (0.189, $p < 0.05$).

Variance of User and User Satisfaction are 0.343 and 0.677 respectively. Use variable can explain 34.3% of the influence from the observed variables (Information Quality, System Quality, Service Quality, and Participation Quality).

User Satisfaction is able to describe 67.7% of the influences of the observed variables. Positive relationship between Use to User Satisfaction (0.732, $p < 0.01$) and User Satisfaction to Use (0.693, $p < 0.01$) are evident.

The path estimates, Use to User Satisfaction and Use to Net Benefits, attained high estimate values (0.723 and 0.7 respectively) with significance level of $p < 0.01$. The results indicated that users use e-government service delivery and they perceive the government is more efficient, provide better service quality and favorable services, enhancing participation, value of money, transparent and has good governance. Variance of Net Benefits is 58% which explains more than half of Use and User Satisfaction. Positive links were observed.

4.9 Summary

Measurement properties of items were investigated as to whether they are acceptable to be applied in CFA. After that, CFA was carried out to validate the re-specifying measurement models. Path analysis was conducted to test the relationships of the twelve proposed hypotheses. A summary of hypotheses testing results are shown in Table 30.

Table 30 Summary of hypothesis testing

Hypotheses	Path links	Results	Remark
H1a	Information Quality → Use	*	Non-significant
H1b	Information Quality → User Satisfaction	Not support	Non-significant
H2a	System Quality → Use	Support	
H2b	System Quality → User Satisfaction	Not support	Non-significant
H3a	Service Quality → Use	*	
H3b	Service Quality → User Satisfaction	Marginal support	Non-significant
H4a	Participation Quality → Use	Support	
H4b	Participation Quality → User Satisfaction	Marginal support	
H5a	Use → User Satisfaction	Support	
H5b	Use → Net Benefits	Support	
H6a	User Satisfaction → Use	Support	
H6b	User Satisfaction → Net Benefits	Support	

*= a negative effect was observed

Source: Developed for this research

Six out of twelve hypotheses are supported and one is marginally supported. Four hypotheses indicated insignificant levels and two were negatively significant. Discussions of research findings, implications, and recommendations for future researches are elaborated in Chapter 5.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The objectives of this research studies are to identify a measurement framework and instrument for e-government service delivery and the focus is on a Thai context. The research model was based on the D&M IS Success Model 2003 and was extended to include government information, services, and citizen participation in an e-government setting. The draft measurement was established, refined and tested through the Construct Development Method (Lewis, et al., 2005). The environment of this study is in a Thai context whereby Thai government websites were evaluated.

The research model comprised seven constructs; Information Quality, System Quality, Service Quality, Participation Quality, Use, User Satisfaction, and Net Benefits. The results showed that e-government service delivery can be systematically evaluated in terms of the preparation of the system, the use of the system, and the consequences of using the system. Participation Quality can be included to measure the success of e-government service delivery with other quality elements; Information, System and Service. Use and User satisfaction measures are applied to described the consumption step and Net Benefits to determine the consequence of using the system.

Chapter 5 consists of a discussion of research findings, the instrument and its measures, and implications in terms of theoretical and practical implication, limitations, and directions for future researches.

5.2 Discussion

In this study, it was posited that there are linkages between Information Quality, System Quality, Service Quality, and Participation Quality with Use, User Satisfaction, and Net Benefits. The results showed that the process of e-government service delivery can be assessed systematically.

The selected research model, the D&M IS Success Model, can be extended to measure in different settings. Like Service Quality that was added to describe a service setting, Participation Quality is added to capture the e-government setting. The process of e-government service delivery is assessed from preparation (Information Quality, System Quality, Service Quality, and Participation Quality), consumption (Use and User Satisfaction), and consequence (Net Benefits).

The model accounted for 58% of the variance in Net Benefits with strong effects from Use and User Satisfaction (see Figure 11). Thirty four percent (34%) of the variance in Use is explained by Information Quality, System Quality, Service Quality, and Participation Quality while sixty-seven percent (67%) of the variance in User Satisfaction is explained by the quality of information, the system, the service, and participation. Thus, Use and User Satisfaction are interrelated. The effect of Use on User Satisfaction is 73% and User Satisfaction on Use is 69. The effect of Use on Net Benefits is 70% and the effect of User Satisfaction on Net Benefits is 42%.

5.2.1 Participation Quality

The instrument enhances the evaluation of the quality of citizen participation together with other measures. The findings indicated that the effect of Participation Quality influenced Use and User Satisfaction positively. Higher quality of participation leads to more use (0.58, $p < 0.01$) and increased levels of satisfaction (0.18, $p < 0.05$).

Unlike other government services, citizen participation is not clearly included in the assessment tools. For example in the UN E-government Survey, e-participation index was added to the survey in 2003, but separated from the E-government Development Index (United Nations, 2003). Other researches measure citizen participation in different ways such as e-governance (Siar, 2005), e-parliament (Kanthawongs & Lee), and citizen engagement (Phippen & Lacohee, 2006).

The instrument from this research study makes it possible to include the quality of participation and to assess as part of the e-government service delivery process.

5.2.2 Information Quality

The results of Information Quality are different from other constructs, as users did not concentrate on the quality of information. The influence of Information Quality on Use is negative (-0.04, $p < 0.1$) which means that the more information is displayed, the less usage occurs. The influence on User Satisfaction is positive (0.05, $p < 0.1$). However, both links indicated a non-significant relationship.

Users in Taiwan contemplated the quality of information provision. The effects of information were on both the Use and the User Satisfaction. Better quality information brought greater use and a higher level of satisfaction (Wang & Liao,

2008). For India, there are over 1,500 online services and they are offered through a central government website. Government information is crucial to Indian citizens. Government services are categorized and digitalized to present on the website (Hirwade, 2010).

Other studies in a Thai context have shown that Information Quality had minimal effects on the adoption of e-government websites (Wangpipatwong, et al., 2005) and continued use (Wangpipatwong, et al., 2008). In 2011, Suree Funikul, Wichian Chutimaskul and Vithida Chongsuphajaisiddhi focused the study on Information Quality and proposed an e-government quality model to tackle information issues and to improve the websites of Thai ministries.

5.2.3 System Quality

The results revealed that users identified System Quality as the important element for their Use (0.43, $p < 0.01$). If the quality of the system increases, users are willing to utilize e-government service delivery. In contrast regarding the link between System Quality and User Satisfaction, the changes of Service Quality present positive impacts on the level of satisfaction (0.05, $p < 0.1$); however, a non-significant relationship is was evident.

Sivaporn Wangpipatwong, Wichian Chutimaskul, and Borworn Papasratorn (2008) revealed that System Quality affected Continue Use of e-government websites in a Thai context the most, compared to Information Quality. If a system is provided with superior quality, users tended to continue using government websites. The result was similar to their study in 2005; users recognized the value of System Quality. The higher the efficiency, the more users adopt e-government websites (Wangpipatwong, et al., 2005).

5.2.4 Service Quality

Service Quality in this research study has a negative relationship with Use (-0.04, $p < 0.1$). If the quality of service is raised, users pay less attention to e-government service delivery. On the other hand, User Satisfaction is affected by Service Quality (0.26, $p < 0.01$), but a non-significant relationship is evident.

The studied of Sivaporn Wangpipatwong, Wichian Chutimaskul, and Borworn Papasratorn (2008) pointed out that quality of service was important to continue using e-government websites, but not as much as System Quality while users of the Greek taxation information system paid more attention to the quality of information and services (Floropoulos, et al., 2010). Taiwanese users recognized the value of quality of service and the level of satisfaction. If service quality is raised, they tend to use more e-government initiatives and their level of satisfaction increases (Wang & Liao, 2008).

5.2.5 Use and User Satisfaction

Use and User Satisfaction are commonly recognized as useful proxy measures for IS Success. They are interrelated and can be evaluated as part of the IS Success, but cannot be measured as a single-item measure (Marchand & Raymond, 2008; Petter & McLean, 2009). User satisfaction is the key in facilitating the examination of users' commitments to government services (Wulf, Schillewaert, Muylle, & Rangarajan, 2006). In the process of e-government service delivery, Use and User Satisfaction are in the consumption step. The quality in the creation step (Information, System, Service, and Participation) affects Use and User Satisfaction.

The relationships between Use to User Satisfaction and vice versa are substantially high. Users that are pleased with e-government service delivery are

likely to return to use it again (0.69, $p < 0.01$). If users make use of e-government service delivery, they are satisfied (0.73, $p < 0.01$).

Other studies related to Thai government services concentrated on Continue Use and the adoption (Wangpipatwong, et al., 2005, 2008) whereas the study of Greek taxation system applied User Satisfaction to determine overall satisfaction to government works (Floropoulos, et al., 2010). Yi-Shun Wang and Yi-Wen Liao (2008) also employed both Use and User Satisfaction to assess e-Government Success in Taiwan using the D&M IS Success Model as a research framework.

5.2.6 Net Benefits

Consequences of the Use and level of satisfaction are connected with Net Benefit. The relationship of Use to Net Benefits (0.7, $p < 0.01$) is far greater than from User Satisfaction (0.426, $p < 0.05$). Measures for Net Benefits in this study derived from the government's policies and strategies, better service quality, good governance, high performance, value for money, favorable services, and enhanced participation. Users have similar ideas as their government as to what they achieve after using e-government services.

Net Benefits of other countries are viewed differently. For example, the success of e-government in Taiwan lies with the perceived benefits of uses. If users believe it is useful, then benefit is achieved (Wang & Liao, 2008). Murray Scott, William H. DeLone, and William Golden (2009) concentrated the study on Net Benefits from citizens' perspectives. Lists of benefits were explored to enhance the understanding of the consequences of using e-government services as part of e-government success.

The results of this research study supported the need to explore the country-specific assessment. The requirements of citizens are diverse. A solution in one country cannot be directly applied successfully in another country. For example, Information Quality that was indicated as an important element in the success of Taiwan e-government success was not considered essential as a Thai e-government measurement tool. The adoption and continued use of e-government websites were more critical in Thai context (Wang & Liao, 2008; Wangpipatwong, et al., 2005, 2008). In addition, the snapshots of global comparison are unable to completely facilitate the improvements of an individual country. It is recommended to identify policies and strategies locally to change to better e-government service delivery (United Nations, 2010, 2012).

Focus has shifted from the supply-side towards the demand side. The results emphasize the importance of assuming a multidimensional interdependent analytical approach. The government should focus on concentrating on various IS success levels. Information Quality, System Quality, Service Quality, and Participation Quality belong to the system development level; whereas Use, User Satisfaction, and Net Benefits are in the effectiveness-influence level (DeLone & McLean, 2003). A High quality system and participation can lead to more use and an enhanced level of user satisfaction. This means that the government should pay more attention to promoting citizen involvement and participation to increase the quality of the system.

5.3 Implications and Recommendations

An Instrument development process provides better understanding of e-government service delivery in many aspects. There are several implications for theory and practices.

Theoretical perspectives and contributions:

a) Better understanding the measurement of e-government service delivery

The research study employed IS theory, the D&M IS Success Model, as an initial framework to compose a measurement instrument for a specific setting. The instrument was theoretically formulated and systematically tested by instrument development for IS research (Lewis, et al., 2005). Researchers can use the validated model as an initial model for the development and improvement of evaluation tools.

E-government service delivery is a process approach from the steps of the creation, the use, and the consequences of the system. The results showed that the entire process can be evaluated from citizens' viewpoints. The multiple dimensions of success and the interrelationships were assessed. The influences of quality measures in the creation step were examined, the level of satisfaction and use were investigated and the expected benefits set by the government were evaluated by citizens. The impacts are not limited to the individual, but also the organization or the government in this research study.

b) Learning from other disciplines

The results showed that an additional variable, Participation Quality, can be included the measurement instrument to capture the uniqueness of Thai government and citizens. Quality of Participation was assessed and recognized as an important part that influences the Use and the level of Satisfaction.

Practitioner perspectives and contributions:

a) Applications of the instrument

Practitioners widely recognize the importance of evaluating e-government service delivery. They are able to collect feedback and compare the results with other government agencies and units. Participation of public servants is important for the improvement of government services (Anthopoulos, Siozos, & Tsoukalas, 2007). The final and validated model offers a practical means for government agencies to assess websites of Thai government agencies in different levels. The results of the evaluation can be shared among government agencies in different departments. They can learn from each other and work together to provide better e-government service delivery.

b) Decision- and policymakers understand the multifaceted nature of e-government service delivery

Decision and policy makers have a better understanding of the multifaceted nature of e-government service delivery. Policies and strategies including expected outcomes and benefits are set by decision makers. The results showed that the instrument can be applied to evaluate the expected outcomes. The measurement can link government policies with citizens' desires if they are moving in the same direction. If not, improvement and adjustment can be done accordingly.

c) The results as guidelines for improvement and development

Developers can extract the measurement results to initiate the required information and services, adjust the design of websites, add new communication channels, and improve the feedback gathering process, etc. The results can be applied as guidelines to increase the efficiency of public administration and to enhance e-government service delivery.

5.4 Limitations and Directions for Future Research

Exploratory research has many limitations which lead to opportunities for future research studies.

Firstly, the investigation is based on an information system of a country, **Thailand**. Thus the interpretation of the results should be confined to Thai settings or to a country with similar settings. Applications of the model to wider Thai audiences can increase knowledge and understanding of Thais' needs. The real needs and expectations of users should be explored and systematically gathered for the alignments of e-government service delivery. Improvement of information and services from Thai government agencies can be achieved in the long run.

Second, the list of items in **Net Benefits variables** in this research study was derived from government plans and strategies such as ICT Master Plan and IT 2010. The aim was to investigate whether citizens have similar expectations to their government. Even though the results showed positive relationships of User and User Satisfaction with Net Benefits, more research should be done from a citizen's perspective. Citizens' needs should be applied in future research.

Third, citizens in general are from diverse backgrounds (Wang & Liao, 2008). Citizens consist of people from all ages, genders and groups. Government is required to provide services to every citizen from infants to senior members. As disabled groups and less fortunate groups are also citizens, ideally. It is imperative that the proposed model is validated in different user populations and e-government contexts. Jennifer Rowley (2011) studied the influence of **stakeholders** for e-government initiatives and found they are able to support the development of knowledge and practice, policy and participation in e-government. This research study

did not explore the group of stakeholders in the questionnaire. Demographic information was determined such as gender, age, education, and career. More research studies in the needs of stakeholders in Thailand can facilitate development processes and service delivery.

The fourth limitation is knowledge of **how citizens connect** to their government agencies. The instrument did not request information on which tools and where the respondents connect to Thai government websites. The fast-moving pace of technological development has given more choices of tools with browsers so respondents are able to communicate with their government at anytime, from anywhere. Samples of tools are Smartphone and tablets. Users in Australia and New Zealand support e-government initiatives but are reluctant to use transactional services. 70% of participants in New Zealand prefer to contact their government through non-digital means, especially the elderly (Gauld, et al., 2010). Study of these communication tools can assist the development of e-government service delivery for Thai society.

Fifth, the list of visit-most-often websites was collected with no **details** of information and services users acquired or why they use it most often. An opportunity lies in a further and in-depth study of users' behavior for each individual website. Their needs can be customized to include trends and additional requirements.

Sixth, the **incomplete questionnaire** represented 18 out of 445 (4%). The last part of the questionnaire was missing. This research study did not look at why the questionnaire could not be completed and from what reasons, such as server and internet connection. There is an opportunity to improve the online questionnaire to tackle the issues and other technical difficulties to smooth the feedback process.

Lastly, this research study explores the feedback from the ones who make use of e-government service delivery. Why others, **non-users**, use only traditional services has received little study. Sivaporn Wangpipatwong, Wichian Chutimaskul, and Borworn Papasratorn (2005) uncovered barriers of e-government adoption for Thai government websites. The top three barriers were that people did not know which websites to use, there was no information of the desired services, and that there was no need for information or forms. Information about non-users should increase understanding and lead to future adjustment and improvement of e-government service delivery.

5.5 Conclusion

The objectives of this study are achieved and a measurement instrument was created through a theoretically conceptualized framework. A systematically built framework is able to facilitate the creating of a meaningful measurement instrument. Because e-government service delivery is a process-oriented practice, a combination of variables can support the evaluation of its success. The framework was crafted from IS theory using the D&M IS Success Model and takes the characteristics of e-government setting. The reliability and validity of items, constructs, the research model and the re-specified model were examined throughout the development process.

The research findings support the research hypotheses, with the exception of the relationships that have no statistical significance; Information Quality and Use, Information Quality and User Satisfaction, System Quality and User Satisfaction, and Service Quality and User Satisfaction. The results of this study encourage both

researchers and government agencies to expand their observations into different areas. New measures, like Participation Quality, have shown the ability to assess the level of satisfaction for citizen participation. The benefits set by government strategies were checked as to whether citizens agreed or not. Understanding of citizen requirements can assist government agencies to take essential action to improve e-government service delivery.

The creation of a measurement instrument provides a better understanding of delivering government services. Citizens' demands are evolving and changing through time. Comparing government successes in the global arena are essential but the most important element is the needs of the local citizens. E-government service delivery is a dynamic and evolving concept. The applicable evaluations would be developed to match its future trends and practices. To conclude, a continuing research in e-government service delivery is vital especially in the local context. The main focus of the government is to its citizens.

BIBLIOGRAPHY

Aksararak, S., & Pornwasin, A. (2004). *Be e-Citizen by e-Government*: Se-Education Public Company Limited.

Al-adawi, Z., Yousafzai, S., & Pallister, J. (2005, 26-28 September). *Conceptual Model of Citizen Adoption of E-government.* Paper presented at the The Second International Conference on Innovations in Information Technology, Dubai, UAE.

Anand, A. (2007). *E-Satisfaction - A Comprehensive Framework.* Paper presented at the Second International Conference on Internet and Web Applications and Services (ICIW 07).

Ancarani, A. (2005). Towards quality e-service in the public sector: The evolution of web sites in the local public service sector. *Managing Service Quality, 15*(1), 6-23.

Andersen, K. V., & Henriksen, H. Z. (2006). E-government maturity models: Extension of the Layne and Lee model. *Government Information Quarterly, 23*, 236-248.

Anderson, J. C., & Gerbing, D. W. (1988). Structural Equation Modeling in Practice: A review and recommended two-step approach. *Psychological Bulletin, 103*(3), 411-423.

Anthopoulos, L. G., Siozos, P., & Tsoukalas, I. A. (2007). Applying participatory design and collaboration in digital public services for discovering and re-designing e-Government services. *Government Information Quarterly, 24*, 353-376.

Apigian, C. H., Ragu-Nathan, B. S., Ragu-Nathan, T. S., & Kunnathur, A. (2005). Internet Technology: The Strategic Imperative. *Journal of Electronic Commerce Research, 6*(2), 123-145.

Ariunaa, L. (2008). An Assessment of the Open Government Website in Mongolia. In A.-V. Anttiroiko (Eds.), Electronic Government: Concepts, Methodologies, Tools, and Applications Available from http://ebookw.net/ebook/scienceengineering/16673-electronic-government-concepts-methodologies.html

Austin, E. K., & Callen, J. C. (2008). Reexamining the role of digital technology in public administration: from devastation to disclosure. *Administrative Theory & Praxis, 30*(3), 324.

Balaban, I., Mu, E., & Divjak, B. (2013). Development of an electronic Portfolio system success model: An information systems approach. *Computers & Education, 60*, 396-411.

Bannister, F. (2007). The Curse of the Benchmark: an assessment of the validity and value of e-government comparisons. *International Review of Administrative Sciences, 73*(2), 171-188.

Barnes, S. J., & Vidgen, R. (2008). Interactive E-Government: Evaluating the Web Site of the UK Inland Revenue. In A.-V. Anttiroiko (Eds.)

Barnett, T., Kellermanns, F. W., Pearson, A. W., & Pearson, R. A. (2006/2007). Measuring Information System Usage: Replication and Extensions *The Journal of Computer Information Systems, 47*(2), 76.

Belanger, F., & Hiller, J. S. (2006). A Framework for E-government: Privacy Implications. *Business Process Management Journal, 12*(1), 48.

Benbasat, I., & Barki, H. (2007). Quo vadis, TAM? *Journal of the Association for Information Systems, 8*(4), 211-218.

Brahma, S. S. (2009). Assessment of Construct Validity in Management Research. *Journal of Management Research, 9*(2), 59-71.

Bressolles, G., & Nantel, J. (2008). The Measurement of Electronic Service Quality: Improvements and Application. *International Journal of E-Business Research, 4*(3), 1-19.

Brewer, G. A., Neubauer, B. J., & Geiselhart, K. (2006). Designing and Implementing E-Government Systems - Critical Implications for Public Administration and Democracy. *Administration & Society, 38*(4), 472-499.

Brown, D. (2005). Electronic Government and Public Administration. *International Review of Administrative Sciences, 71*(2), 241-254.

Brown, M. M. (2007). Understanding E-Government Benefits. *The American Review of Public Administration, 37*(2), 178-197.

Burton-Jones, A., & Hubona, G. S. (2005). Individual Differences and Usage Behavior: Revisiting a Technology Acceptance Model Assumption. *The Data Base for Advances in Information Systems, 36*(2), 58.

Caddy, J. (2001). Why citizens are central to good governance. *Organisation for Economic Cooperation and Development. The OECD Observer*(229), 59.

Cameron, R. (2009). A sequential mixed model research design: Design, analytical and display issues. *International Journal of Multiple Research Approaches, 3*(2), 140-152.

Carter, L. (2008). E-government diffusion: a comparison of adoption constructs. *Transforming Government: People, Process and Policy, 2*(3), 147-161.

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

Castro, F. G., Kellison, J. G., Boyd, S. J., & Kopak, A. (2010). A Methodology for Conducting Integrative Mixed Methods Research and Data. *Journal of Mixed Methods Research, 4*, 342.

Chang, L.-M., Chang, S.-I., Ho, C.-T., Yen, D., & Chiang, M.-C. (2011). Efftect of IS Characteristics on E-Business Success Factors of Small- and Medium-sized Enterprises. *Computers in Human Behavior, 27*, 2129-2140.

Chau, P. Y. K. (1997). Reexamining a Model for Evaluating Information Center Success Using a Structural Equation Modeling Approach. *Decision Sciences, 28*(2), 309.

Chavan, M. (2009). The Balanced Scorecard: a new challenge. *Journal of Management Development, 28*(5), 393-406.

Cheng, T. E., & Choy, P. W. (2007). Measuring Success Factors of Quality Management in the Shipping Industry. *Maritime Economics & Logistics, 9*, 234-253.

Churchill, G. A. (1979). A Paradigm for Developing Better Measures of Marketing Constructs. *Journal of Marketing Research, 16*(1), 64-73.

Creswell, J. W., & Clark, V. L. P. (2007). *Designing and Conducting Mixed Methods Research*: SAGE Publications.

Cronbach, L. J. (1951). Coefficient alpha and internal structure of tests. *Psychometric, 16*, 297-334.

Davis, F. D. (1989). Perceived usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly, 13*(3), 319-340.

DeLone, W. H., & McLean, E. R. (1992). Information Systems Success: The Quest for the Dependent Variable. *Information Systems Research, 3*(1), 60-95.

DeLone, W. H., & McLean, E. R. (2002). *Information Systems Success Revisited.* Paper presented at the The 35th Hawaii International Conference on System Sciences, USA.

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean Model of Information Systems Success: A Ten Year Update. *Journal of Management Information Systems, 19*(4), 9-30.

DeVillis, R. F. (2003). *Scale Development: Theory and Applications* (Second ed.).

Donnelly, M. (1999). Making the difference: quality strategy in the public sector. *Managing Service Quality, 9*(1), 47-52.

Evans, D., & Yen, D. C. (2006). E-Government: Evolving relationship of citizens and government, domestics, and international development. *Government Information Quarterly, 23*, 207-235.

Fedotova, O., Teixeira, L., & Alvelos, H. (2012). E-participation in Portugal: evaluation of government electronic platforms. *Procedia Technology, 5*, 152-161.

Floropoulos, J., Spathis, C., Halvatzis, D., & Tsipouridou, M. (2010). Measuring the success of the Greek Taxation Information System. *International Journal of Information Management, 30*, 47-56.

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research, 18*(1), 39.

Funikul, S., Quirchmayr, G., Chutimaskul, W., & Traunmüller, R. (2006). *An Evaluation Framework for eGovernment Services Based on Principles Laid Out in COBIT, the ISO 9000 Standard, and TAM.* Paper presented at the 17th Australasian Conference on Information System Adelaide, Australia.

Gable, G. G., Sedera, D., & Chan, T. (2008). Re-conceptualizing Information System Success: The IS-Impact Measurement Model. *Journal of the Association for Information Systems, 9*(7), 377-408.

Garver, M. S., & Mentzer, J. T. (1999). Logistics Research Methods: Employing Structural Equation Modeling to test for Construct Validity. *Journal of Business Logistics, 20*(1), 33.

Gauld, R., Goldfinch, S., & Horsburgh, S. (2010). Do they want it? Do they use it? The 'Demand-Side' of e-Government in Australia and New Zealand. *Government Information Quarterly, 27*, 177-186.

Gefen, D., Karahanna, E., & Straub, D. W. (2003). Trust and TAM in Online Shopping: An Integrated Model. *MIS Quarterly, 27*(1), 51.

Gerbing, D. W., & Anderson, J. C. (1988). An Updated Paradigm for Scale Development incorporating Unidimensionality and Its Assessment. *Journal of Marketing Research, 25*(2), 186-192.

Ghandour, A., Benwell, G., & Deans, K. (2010). Measuring eCommerce Website Success. *Interdisciplinary Journal of Contemporary Research in Business, 1*(12), 21-41.

Gilbert, D., Balestrini, P., & Littleboy, D. (2004). Barriers and benefits in the adoption of e-government. *The International Journal of Public Sector Management, 17*(4), 286.

Goldkuhl, G. (2008). *Citizen Roles in E-government.* Paper presented at the ECIS Workshop on E-government, Galway.

Gorla, N., Somers, T. M., & Wong, B. (2010). Organizational Impact of System Quality, Information Quality, and Service Quality. *Journal of Strategic Information Systems, 19*(207-288).

Gorman, G. E., & Clayton, P. (2005). *Qualitative Research for the Information Professional: A Practical Handbook* (2nd ed.): Facet Publishing.

Grönlund, Å. (2003). e-Democracy: in search of Tools and Methods for Effective Participation. *Journal of Multicriteria Decision Analysis, 12*(2-3), 93.

Guimaraes, T., Armstrong, C. P., & Jones, B. M. (2009). A New Approach to Measuring Information System Quality. *The Quality Management Journal, 16*(1), 42.

Guo, X., & Lu, J. (2008). Effectiveness of E-Government Online Services in Australia. In A.-V. Anttiroiko (Eds.), Electronic Government: Concepts, Methodologies, Tools, and Applications Available from http://ebookw.net/ebook/scienceengineering/16673-electronic-government-concepts-methodologies.html

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1995). *Multivariate Data Analysis with Readings* (4th ed.). Englewood Cliffs, NJ: Prentice-Hall.

Hair, J. F., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate Data Analysis* (5th ed.): Prentice-Hall International, Inc.

Hair, J. F., Bush, R. P., & Ortinau, D. J. (2003). *Marketing Research within a Changing Information Environment*: McGraw-Hill Irwin.

Halaris, C., Magoutas, B., Papadomichelaki, X., & Mentzas, G. (2007). Classification and synthesis of quality approaches in e-government services. *Internet Research, 17*(4), 378-401.

Heeks, R. (2006). *Understanding and Measuring eGovernment: International Benchmarking Studies*. Paper presented at the UNDESA Workshop.

Henry, N. (2001). *Public Administration and Public Affairs* (8th ed.): Prentice-Hall, Inc.

Hirwade, M. A. (2010). Responding to information needs of the citizens through e-government portals and online services in India. *The International Information & Library Review, 42*, 154-163.

Hoffman, K. D., & Bateson, J. E. G. (2006). *Services Marketing: Concepts, Strategies, & Cases* (3rd ed.): Thomson South-Western.

Hooper, D., Coughlan, J., & Mullen, M. R. (2008). Structural Equation Modeling: Guidelines for Determining Model Fit. *The Electronic Journal of Business Research Methods, 6*(1), 53-60.

Hussein, R., Karim, N. S. A., & Selamet, M. H. (2007). The impact of technological factors on information systems success in the electronic-government context. *Business Process Management Journal, 13*(5), 613-627.

Iacobucci, D. (2010). Structural equations modeling: Fit Indices, sample size, and advanced topics. *Journal of Consumer Psychology, 20*, 90-98.

Iversen, E. J., Vedel, T., & Werle, R. (2004). Standardization and the Democratic Design of Information and Communication Technology. *Knowledge, Technology, & Policy, 17*(2), 104-126.

Jansen, J., Vries, S. d., & Schaik, P. v. (2010). The Contextual Benchmark Method: Benchmarking e-Government services. *Government Information Quarterly, 27*, 213-219.

Jennex, M. E., & Olfman, L. (2008). A Model of Knowledge Management Success. In M. E. Jennex (Eds.) Available from http://mehralborz.com/Files/book2/IGI.Global.Current.Issues.in.Knowledge.Management.Feb.2008.pdf#page=53

Kamal, M. M. (2009). An analysis of e-Participation research: moving from theoretical to pragmatic viewpoint. *Transforming Government: People, Process and Policy, 3*(4), 340-354.

Kanthawongs, P. (2005). The User Perspective of the E-Parliament Systems in Thailand. *The Business Review, Cambridge, 4*(2), 85.

Kanthawongs, P., & Lee, S. M. Enabling E-Parliament Systems to Enhance User Engagement: A Case Study of the Thai Parliament. Retrieved from http://www.bu.ac.th/knowledgecenter/epaper/july_dec2009/pdf/Penjira.pdf

Keehley, P., & MacBride, S. A. (1997). Can Benchmarking for Best Practices Work for Government? *Quality Progress, 30*(3), 75.

Khalifa, M., & Liu, V. (2004). The State of Research on Information System Satisfaction. *Journal of Information Technology Theory and Application, 5*(4), 37.

Khayun, V., Ractham, P., & Firpo, D. (2012). Assessing E-excise Success with DeLone and McLean's Model. *The Journal of Computer Information Systems, 52*(3), 31.

Kim, C., Galliers, R. D., Shin, N., Ryoo, J.-H., & Kim, J. (2012). Factors influencing Internet shopping value and customer repurchase intention. *Electronic Commerce Research and Applications, 11*, 374-387.

Kuzma, J. M. (2010). Accessibility design issues with UK e-government sites. *Government Information Quarterly, 27*, 141-146.

Lambert, D. M., & Harrington, T. C. (1990). Measuring Nonresponse Bias in Customer Service Mail Surveys. *Journal of Business Logistics, 11*(2), 5.

Lancaster, G. A., Dodd, S., & Williamson, P. R. (2004). Design and Analysis of Pilot Studies: Recommendations for good practice. *Journal of Evaluation in Clinical Practice, 10*(2), 307-312.

Landrum, H., & Prybutok, V. R. (2004). A Service Quality and Success Model for the Information Service Industry. *European Journal of Operation Research, 156*, 628-642.

Lawshe, C. H. (1975). A Quantitative Approach to Content Validity. *Personnel Psychology, 28*, 563=575.

Layne, K., & Lee, J. (2001). Developing fully functional E-government: A four stage model. *Government Information Quarterly, 18*, 122-136.

Lean, O. K., Zailani, S., Ramayah, T., & Fernando, Y. (2009). Factors influencing intention to use e-government services among citizens in Malaysia. *International Journal of Information Management, 29*, 458-475.

Lee, G., & Kwak, Y. H. (2012). An Open Government Maturity Model for social media-based public engagement. *Government Information Quarterly, 29*, 492-503.

Lee, H., Irani, Z., Osman, I. H., Balci, A., Ozkan, S., & Medeni, T. D. (2008). Research Note: Toward a reference process model for citizen-oriented evaluation of e-government services. *Transforming Government: People, Process and Policy, 2*(4), 297-310.

Lee, J. (2010). 10 year retrospect on stage models of e-Government: A qualitative meta-synthesis. *Government Information Quarterly, 27*, 220-230.

Lee, K. C., & Chung, N. (2009). Understanding Factors Affecting Trust in and Satisfaction with Mobile Banking in Korea: A modified DeLond and McLean's model perspective. *Interacting with Computers, 21*(385-392).

Lee, K. C., Kirlidog, M., Lee, S., & Lim, G. G. (2008). User evaluations of tax filing web sites: A comparative study of South Korea and Turkey. *Online Information Review, 32*(6), 842-859.

Lewis, B. R., Templeton, G. F., & Byrd, T. A. (2005). A Methodology for Construct Development in MIS Research. *European Journal of Information Systems, 14*, 388-400.

Loiacono, E. T., Watson, R. T., & Goodhue, D. L. (2002). WebQual: A measure of website quality. *American Marketing Association, 13*, 432.

Lu, J., Yu, C.-S., Liu, C., & Yao, J. E. (2003). Technology acceptance model for wireless internet. *Internet Research: Electronic Networking Applications and Policy, 13*(3), 206-222.

Macintosh, A. (2004). *Characterizing E-Participation in Policy-Making.* Paper presented at the 37th Hawaii International Conference on System Sciences, USA.

Macintosh, A., & Whyte, A. (2008). Towards an evaluation framework for eParticipation. *Transforming Government: People, Process and Policy, 2*(1), 16-30.

MacKenzie, S. B., Podsakoff, P. M., & Podsakoff, N. P. (2011). Construct Measurement and Validation Procedures in MIS and Behavioral Research: Integrating New and Existing Techniques. *MIS Quarterly, 35*(2), 293-334.

Marchand, M., & Raymond, L. (2008). Researching performance measurement systems: An information system perspective. *International Journal of Operations & Production Management, 28*(7), 663-686.

Martin, E. W., Brown, C. V., DeHayes, D. W., Hoffer, J. A., & Perkins, W. C. (2005). *Managing Information Technology* (Fifth ed.): Pearson Education International.

Ministry of Information and Communication Technology. (2011). *National ICT Policy Framework 2011-2020: ICT 2020*: Ministry of Information and Communication Technology.

Miranda, F. J., Sanguino, R., & Bañegil, T. M. (2009). Quantitative Assessment of European Municipal Web Sites - Development and use of an evaluation tool. *Internet Research, 19*(4), 425-441.

Money, W., & Turner, A. (2004). *Application of the Technology Acceptance Model to a Knowledge Management System.* Paper presented at the The 37th Hawaii International Conference on System Sciences, Hawaii, USA.

Moon, M. J. (2002). The Evolution of E-Government among Municipalities: Rhetoric or Reality? *Public Administration Review, 62*(4), 424-433.

Myers, B. L., Kappelman, L. A., & Prybutok, V. R. (1997). A Comprehensive Model for Assessing the Quality and Productivity of the Information Systems Function: Toward a Theory for Information Systems Assessment. *Information Resources Management Journal, 10*(1), 6-25.

National Electronics and Computer Technology Center. (2003). *Thailand Information and Communication Technology (ICT) Master Plan 2002-2006*: National Electronics and Computer Technology Center.

National Electronics and Computer Technology Center. (2009). *The Second Thailand Information and Communication Technology (ICT) Master Plan (2009-2013)*: Ministry of Information and Communication Technology and National Electronics and Computer Technology Center.

National Information Technology Committee Secretariat. (2003). *Information Technology Policy Framework 2001-2010*: National Electronics and Computer Technology Center.

Neuman, W. L. (2006). *Social Research Methods: Qualitative and Quantitative Approaches* (6th ed.): Pearson Education International

Noar, S. M. (2003). The Role of Structural Equation Modeling in Scale Development. *Structural Equation Modeling, 10*(4), 622-647.

Nunnaly, J. C. (1978). *Psychometric theory*. New York: McGraw-Hill.

Office of the Public Sector Development Commission. Public Sector Reform Initiative. Retrieved 1 June, 2009, from http://www.opdc.go.th/english/main/content_view.php?cat_id=2

Office of the Public Sector Development Commission. (2003). Royal Decree on Criteria and Procedures for Good Governance, B.E. 2546 (2003). Retrieved 15 September, 2009, from http://www.opdc.go.th/english/main/content_view.php?cat_id=3

Organisation for Economic Co-operation and Development. (2003). Promise and problems of e-democracy: challenges of online citizen engagement Available from http://www.oecd.org/dataoecd/9/11/35176328.pdf

Panopoulou, E., Tambouris, E., & Tarabanis, K. (2008). A framework for evaluating web sites of public authorities. *Aslib Proceedings New Information Perspectives, 60*(5), 517-546.

Panopoulou, E., Tambouris, E., & Tarabanis, K. (2009). eParticipation initiatives: How is Europe progressing? *European Journal of ePractice*. Retrieved from www.epracticejournal.eu

Papadomichelaki, X., & Mentzas, G. (2012). e-GovQual: A multiple-item scale for assessing e-government service quality. *Government Information Quarterly, 29*, 98-109.

Parasuraman, A., Berry, L. L., & Zeithaml, V. A. (1991). Understanding Customer Expectation of Service. *Sloan Management Review, 32*(3), 39.

Parasuraman, A., & Zeithaml, V. A. (2005). E-S-QUAL: A multiple-item scale for Assessing Electronic Delivery. *Journal of Service Research: JSR, 7*(3), 213.

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988). SERVQUAL: A Multiple-Item Scale for Measuring Consumer Perceptions of Service Quality *Journal of Retailing, 64*(1), 12.

Pearlson, K. E., & Saunders, C. S. (2006). *Managing & Using Information Systems: A Strategic Approach* (Third Edition ed.): John Wiley & Sons Australia, Ltd.

Peter, J. P. (1979). Reliability: A Review of Psychometric Basics and Recent Marketing Practices. *Journal of Marketing Research, 16*(1), 6-17.

Peter, J. P. (1981). Construct Validity: A Review of Basic Issues and Marketing Practices. *Journal of Marketing Research, 18*(2), 133-145.

Petter, S., DeLone, W., & McLean, E. (2008). Measuring information systems success: models, dimensions, measures, and interrelationships. *European Journal of Information Systems, 17*, 236-263.

Petter, S., & McLean, E. R. (2009). A Meta-analytic Assessment of the DeLone and McLean IS Success Model: An examiniation of IS Success at the individual level. *Information & Management, 46*, 159-166.

Phippen, A., & Lacohee, H. (2006). eGovernment - issues in citizen engagement. *BT Technology Journal, 24*(2), 205-208.

Previtali, P., & Bof, F. (2009). E-government adoption in small Italian municipalities. *International Journal of Public Sector Management, 22*(4), 338-348.

Prybutok, V. R., Zhang, X., & Ryan, S. D. (2008). Evaluating leadership, IT quality, and net benefits in an e-government environment. *Information & Management, 45*, 143-152.

Rai, A., Lang, S. S., & Welker, R. B. (2002). Assessing the validity of IS Success models: An empirical test and theoretical analysis. *Information Systems Research, 13*(1), 50.

Rocheleau, B. (2000). Prescriptions for Public-Sector Information Management: A Review, Analysis, and Critique. *American Review of Public Administration, 30*(4), 414-435.

Roh, T. H., Ahn, C. K., & Han, I. (2005). The Priority Factor Model for Customer Relationship Management System Success. *Expert Systems with Applications, 28*, 641-654.

Rorissa, A., & Demissie, D. (2012). An analysis of African e-Government service websites. *Government Information Quarterly, 27*, 161-169.

Rorissa, A., Demissie, D., & Pardo, T. (2011). Benchmarking e-Government: A comparison of frameworks for computing e-Government index and ranking. *Government Information Quarterly, 28*, 354-362.

Rotchanakitumnuai, S. (2008). Measuring e-government service value with the E-GOVSQUAL-RISK Model. *Business Process Management Journal, 14*(5), 724-737.

Sæbø, Ø., Rose, J., & Flak, L. S. (2008). The shape of eParticipation: Characterizing and emerging research area. *Government Information Quarterly, 25*, 400-428

Salem, F. (2007). Benchmarking the e-government bulldozer: beyond measuring the tread marks. *Measuring Business Excellence, 11*(4), 9-22.

Sang, S., Lee, J.-D., & Lee, J. (2009). E-government adoption in ASEAN: the case of Cambodia. *Internet Research, 19*(5), 517-534.

Sarabdeen, J., & Rodrigues, G. (2010). Gender differences in E-government Adoption in Dubai. *The Business Review, Cambridge, 16*(2), 120-126.

Sax, L. J., Gilmartin, S. K., & Bryant, A. N. (2003). Assessing Response Rates and Nonresponse Bias in Web and Paper Surveys. *Research in Higher Education, 44*(4), 409.

Saxena, K. B. C. (2005). Towards excellence in e-governance. *The International Journal of Public Sector Management, 18*(6/7), 498.

Schaupp, L. C., Belanger, F., & Fan, W. (2009). Examining the success of websites beyond e-commerce: An extension of the IS Success Model. *The Journal of Computer Information Systems, 49*(4), 42.

Schreiber, J. B., Stage, F. K., & King, J. (2006). Reporting Structural Equation Modeling and Confirmatory Factor Analysis Results: A Review. *The Journal of Educational Research, 99*(6), 323.

Scott, M., DeLone, W. H., & Golden, W. (2009). *Understanding Net Benefits: A Citizen-based Perspective on eGovernment Success.* Paper presented at the Thirtieth International Conference on Information Systems, Phoenix, USA.

Sethi, V., & King, W. R. (1991). Construct Measurement in Information Systems Research: An Illustration in Strategic Systems. *Decision Sciences, 22*(3), 455.

Shackleton, P. (2006). E-government services in the local government context: an Australian case study. *Business Process Management Journal, 12*(1), 88-100.

Shah, R., & Goldstein, S. M. (2006). Use of Structural Equation Modeling in Operations Management Research: Looking back and forward. *Journal of Operation Management, 24*, 148-169.

Shalini, R. T. (2009). Are Mauritians ready for e-Government services? *Government Information Quarterly, 26*, 536-539.

Siar, S. V. (2005). E-governance at the Local Government Level in the Philippines: An Assessment of City Government Websites. *Philippine Journal of Development, 32*(2), 135.

Siau, K., & Long, Y. (2005). Synthesizing e-government stage models - a meta - synthesis based on meta-ethnography approach. *Industrial Management & Data Systems, 105*(4), 443-458.

Siddiquee, N. A. (2008). Service delivery innovations and governance: the Malaysian experience. *Transforming Government: People, Process and Policy, 2*(3), 194-213.

Stahl, B. C. (2005). The Ethical Problem of Framing e-Government in Terms of e-Commerce. *The Electronic Journal of e-Government, 3*(2), 77-86. Retrieved from www.ejeg.com

Straub, D. W., & Carison, C. L. (1989). Validating Instruments in MIS Research. *MIS Quarterly, 13*(2), 147.

Surjadjaja, H., Ghosh, S., & Antony, J. (2003). Perspectives: Determining and assessing the determinants of e-service operations. *Managing Service Quality, 13*(1), 39-53.

Tambouris, E., Liotas, N., & Tarabanis, K. (2007). *A Framework for Assessing eParticipation Projects and Tools.* Paper presented at the 40th Hawaii International Conference on System Sciences USA.

Thailand Information and Communication Technology (ICT) Master Plan (2002-2006). (2003). Retrieved July, 2006

The Organisation for Economic Co-operation and Development. (2003). *The e-Government Imperative*: The Organisation for Economic Co-operation and Development (OECD).

Tojib, D. R., & Sugianto, L.-F. (2006). Content Validity of Instruments in IS Research. *Journal of Information Technology Theory and Application (JITTA), 8*(3), 31-56.

Tubtimhin, J. (2005). Tech Trends: IT. [Interview]. *NECTEC Newsletter, 12*(64), 55-60.

United Nations. (2001). *Benchmarking E-government: A Global Perspective*: United Nations.

United Nations. (2003). *UN Global E-Government Survey 2003*: United Nations.

United Nations. (2004). *The UN Global e-Government Readiness Report 2004 – Towards access for opportunity* (No. UNPAN/2004/11): United Nations.

United Nations. (2005). *Global E-Government Readiness Report 2005 - From e-government to e-inclusion* (No. UNPAN/2005/14): United Nations.

United Nations. (2008). *UN e-Government Survey 2008 – from e-government to connected governance* (No. ST/ESA/PAD/SER.E/112): United Nations.

United Nations. (2010). *United Nations Global e-Government Survey 2010 – Leveraging e-government at a time of financial and economic crisis* (No. ST/ESA/PAD/SER.E/131): United Nations.

United Nations. (2012). *United Nations E-Government Survey 2012: E-Government for the People*: United Nations.

Vanthanophas, V., krittayaphongphun, N., & Klomsiri, C. (2008). Technology acceptance toward e-government initiative in Royal Thai Navy. *Transforming Government: People, Process and Policy, 2*(4), 256-282.

Venkatesh, V., & Davis, F. D. (2000). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. *Management Science, 46*(2), 186.

Wang, Y.-S., & Liao, Y.-W. (2008). Assessing eGovernment Systems Success: A Validation of the DeLone and McLean Model of Information System Success. *Government Information Quarterly, 25*.

Wangpipatwong, S., Chutimaskul, W., & Papasratorn, B. (2005, 19-20 November). *Factors influencing the Adoption of Thai eGovernment Websites: Information Quality and System Quality Approach.* Paper presented at the The Fourth International Conference on eBusiness, Bangkok, Thailand.

Wangpipatwong, S., Chutimaskul, W., & Papasratorn, B. (2008). Quality Enhancing the Continued Use of E-Government Web Sites: Evidence from E-Citizens of Thailand. *International Journal of Electronic Government Research, 5*(1), 19.

Wauters, P. (2006). Benchmarking e-government policy within the e-Europe programme. [General review]. *Aslib Proceedings: New Information Perspectives, 58*(5), 389-403.

Webb, H. W., & Webb, L. A. (2004). SiteQual: an integrated measure of Web Site quality. *Journal of Enterprise Information Management, 17*(6), 430-440.

Weinstein, L. (2009). Achieving Top Quality. *Strategic Finance*, 46-51.

West, D. M. (2004). E-Government and the Transformation of Service Delivery and Citizen Attitudes. *Public Administration Review, 64*(1), 15.

Whitmore, A. (2012). A Statistical Analysis of the Construction of the United Nations E-Government Development Index. *Government Information Quarterly, 29*.

Wickramasekera, R. (2006). Stage Models Re-visited: A measure of the stage of internationalisation of a firm. *Management International Review, 46*, 39-55.

Williams, M. D. (2008). E-government adoption in Europe at regional level. *Transforming Government: People, Process and Policy, 2*(1), 47-59.

Wixom, B. H., & Todd, P. A. (2005). A Theoretical Integration of User Satisfaction and Technology Acceptance. *Information Systems Research, 16*(1), 85.

Wulf, K. D., Schillewaert, N., Muylle, S., & Rangarajan, D. (2006). The Role of Pleasure in Web Site Success. *Information & Management, 43*, 434-446.

Xie, Z. C., & Barnes, S. J. (2008/2009). Web Site Quality in the UK Airline Industry: A Longitudinal Examination. *The Journal of Computer Information Systems, 49*(2), 50.

Yuan, L., Xi, C., & Xiaoyi, W. (2012). Evaluating the readiness of government portal websites in China to adopt contemporary public administration principles. *Government Information Quarterly, 29*, 403-412.

Zeithaml, V. A., Parasuraman, A., & Maholtra, A. (2002). Service Quality Delivery Through Web Sites: A Critical Review of Extant Knowledge. *Journal of the Academy of Marketing Science, 3*(4), 362-375.

Zissis, D., Lekkas, D., & Papadopoulou, A.-E. (2009). Competent Electronic Participation Channels in Electronic Democracy. *Electronic Journal of e-Government, 7*(2), 195-208.

Zokaee, S., Ebrahimi, S. B., & Ghazizadeh, M. (2012). Electronic Payment Systems Evaluation: A Case Study in Iran. *Information Management and Business Review, 4*(3), 120-127.

APPENDIX A

List of Thai Government Websites

	Web site (URL)	Name of agencies
1	www.mod.go.th	Ministry of Defense
2	www.rtart.mi.th	Royal Thai Armed Forces Head Quarters
3	www.radc.go.th	Royal Aide-de-Camp Department
4	www.mof.go.th	Ministry of Finance
5	www.rd.go.th	Revenue Department
6	www.excise.go.th	Excise Department
7	www.mfa.go.th	Ministry of Foreign Affair
8	www.consular.go.th	Department of Consular Affairs
9	http://www.tica.thaigov.net/tica/	Thailand International Development Cooperation Agency
10	www.m-society.go.th	Ministry of Social Development and Human Security
11	www.women-family.go.th	Office of Women's Affairs and Family Development
12	www.dsdw.in.th	Department of Social Development and Welfare
13	www.mots.go.th	Ministry of Tourism and Sports
14	www.tourism.go.th	Department of Tourism
15	www.ipe.ac.th	Institute of Physical Education
16	www.moac.go.th	Ministry of Agriculture and Cooperatives
17	http://www.fisheries.go.th/	Department of Fisheries
18	www.doa.go.th	Department of Agriculture
19	www.mot.go.th	Ministry of Transport
20	www.md.go.th	Marine Department
21	www.doh.go.th	Department of Highways
22	www.mnre.go.th	Ministry of Natural Resources and Environment
23	www.pcd.go.th	Pollution Control Department
24	www.dwr.go.th	Department of Water Resources
25	www.mict.go.th	Ministry of Information and Communication Technology
26	www.tmd.go.th	Thai Meteorological Department
27	www.nso.go.th	National Statistic Office
28	www.energy.go.th	Ministry of Energy
29	www.doeb.go.th	Department of Energy Business
30	www.dmf.go.th	Department of Mineral Fuels
31	www.moc.go.th	Ministry of Commerce
32	www.dft.go.th	Department of Foreign Trade
33	www.depthai.go.th	Department of Export Promotion
34	www.moi.go.th	Ministry of Interior
35	www.sbpac.go.th	The Southern Border Province Administration Center
36	www.law.moi.go.th	Legal Affair Bureau, Office of the Permanent Secretary
37	www.moj.go.th	Ministry of Justice
38	www.correct.go.th	Department of Corrections

	Web site (URL)	Name of agencies
39	www.cifs.moj.go.th	Central Institute of Forensic Science
40	www.mol.go.th	Ministry of Labor
41	www.sso.go.th	Social Security Office
42	www.doe.go.th	Department of Employment
43	www.m-culture.go.th	Ministry of Culture
44	www.dra.go.th	Department of Religious Affairs
45	www.fabeta.finearts.go.th	The Fine-Arts Department
46	www.most.go.th	Ministry of Science and Technology
47	www.dss.go.th	Department of Science Service
48	www.oaep.go.th	Office of Atoms for Peace
49	www.moe.go.th	Ministry of Education
50	www.obec.go.th	Office of the Basic Education Commission
51	www.vec.go.th	Vocational Education Commission
52	www.moph.go.th	Ministry of Public Health
53	www.dms.moph.go.th	Department of Medical Services
54	www.anamai.moph.go.th	Department of Health
55	www.industry.go.th	Ministry of Industry Thailand
56	www.diw.go.th	Department of Industrial Works
57	www.oie.go.th	The Office of Industrial Economics
58	www.thaigov.go.th	Office of the Prime Minister
59	www.nia.go.th	National Intelligence Agency
60	www.opde.go.th	Office of Public Sector Development Commission

	Web site (URL)	Name of agencies
39	www.cifs.moj.go.th	Central Institute of Forensic Science
40	www.mol.go.th	Ministry of Labor
41	www.sso.go.th	Social Security Office
42	www.doe.go.th	Department of Employment
43	www.m-culture.go.th	Ministry of Culture
44	www.dra.go.th	Department of Religious Affairs
45	www.fabeta.finearts.go.th	The Fine-Arts Department
46	www.most.go.th	Ministry of Science and Technology
47	www.dss.go.th	Department of Science Service
48	www.oaep.go.th	Office of Atoms for Peace
49	www.moe.go.th	Ministry of Education
50	www.obec.go.th	Office of the Basic Education Commission
51	www.vec.go.th	Vocational Education Commission
52	www.moph.go.th	Ministry of Public Health
53	www.dms.moph.go.th	Department of Medical Services
54	www.anamai.moph.go.th	Department of Health
55	www.industry.go.th	Ministry of Industry Thailand
56	www.diw.go.th	Department of Industrial Works
57	www.oie.go.th	The Office of Industrial Economics
58	www.thaigov.go.th	Office of the Prime Minister
59	www.nia.go.th	National Intelligence Agency
60	www.opde.go.th	Office of Public Sector Development Commission

APPENDIX B

Construct, Items, and Item Statements

1. **Information Quality:** Information quality captures content issue and measures the success of the information in transferring the intended meaning (DeLone & McLean, 2002, 2003).

Item	Item statement
Accuracy	The Information on e-government web site should be correct and reliable (Wangpipatwong, et al., 2008).
Completeness	The information has sufficient breadth and depth for the task at hand (Guimaraes, Armstrong, & Jones, 2009; Wangpipatwong, et al., 2008).
Security	The degree to which the site is safe and protects customer information (Parasuraman & Zeithaml, 2005).
Relevance	Information on e-government web site should be relevant to the site and corresponds to the need (Wangpipatwong, et al., 2008).
Timeliness	The information is current and timely (Guimaraes, et al., 2009; Wangpipatwong, et al., 2008).
Understandability	The information is clear and easy to comprehend (Guimaraes, et al., 2009; Wangpipatwong, et al., 2008).

2. **System Quality:** System Quality measures the success of the accuracy and efficiency of the communication system that produces information or in technical level (DeLone & McLean, 2003).

Item	Item statement
Dependability	The system is accurate and dependable over time (Wangpipatwong, et al., 2008).
Ease of use	The system can be accessed or used with relatively low effort (Guimaraes, et al., 2009; Wangpipatwong, et al., 2008).
Efficiency	The ease and speed of accessing and using the site (Parasuraman & Zeithaml, 2005).
Functionality	The required functions are available in the system (Guimaraes, et al., 2009; Wangpipatwong, et al., 2008).
System availability	The correct technical functioning of the site (Parasuraman & Zeithaml, 2005).
Usability	Customer perception of degree of user friendliness in using the web site and ease of navigation - As cited in (Swaid and Wigand 2009).
Usefulness	The benefits that the user believes to derive from the system, including convenience, saving time and saving cost (Wangpipatwong, et al., 2008).

3. **Service Quality:** Service Quality means the quality of the support that system users receive from the IS department (DeLone & McLean, 2003; Petter, et al., 2008).

Item	Item statement
Assurance	Knowledge and courtesy of employees and their ability to inspire trust and confidence Responsible staff should have the knowledge and ability to inspire trust and confidence. The staff should provide impeccable response to convey trust and confidence to citizens (Wangpipatwong, et al., 2008).
Empathy	Responsible staff should give caring and individualized attention to citizen such as providing individualized attention to individual concerns and requests, through email communication rather than generic auto-reply message (Wangpipatwong, et al., 2008).
Reliability	Ability to perform the promised service dependably and accurately (Parasuraman, Berry, & Zeithaml, 1991; Parasuraman, et al., 1988; Wangpipatwong, et al., 2008).
Responsiveness	Willingness to help customers and provide prompt service (Parasuraman, et al., 1991; Parasuraman, et al., 1988; Wangpipatwong, et al., 2008).
Tangibility	Physical facilities, equipment and appearance of personnel (Parasuraman, et al., 1988; Wangpipatwong, et al., 2008).

4. **Participation Quality:** Participation quality is referred to the ability of online services of government agencies in order to support the democratic process including e-voting and e-decision-making (Macintosh & Whyte, 2008).

Item	Item statement
Access	The parties have access to the information they consider relevant and to the technical means necessary to collect and evaluate the information (Iversen, et al., 2004).
Accountability	Procedures and rules must be available to identify the responsible actors without infringing upon somebody's privacy (Iversen, et al., 2004).
Contestability	It must be possible to challenge opinions, decisions and actions without violating freedom of speech principles (Iversen, et al., 2004).
Equality	All parties have the same rights (Iversen, et al., 2004).
Openness	All interested parties can participate or are represented in collective decision-making (Iversen, et al., 2004).
Transparency	The relevant principles and rules must be clear and known by all interested parties (Iversen, et al., 2004).

5. **Use:** Consumption of an IS or its output described in terms of actual or self-reported usage (Petter & McLean, 2009).

6. **User satisfaction**: The overall satisfaction of users upon the usage of e-government service delivery (DeLone & McLean, 2003; Petter, et al., 2008).

7. **Net Benefits**: The effect as IS has on an individual, group, industry, society, etc (Petter & McLean, 2009).

Item	Item statement
Better service quality	Increase efficiency (National Electronics and Computer Technology Center, 2009; National Information Technology Committee Secretariat, 2003; Office of the Public Sector Development Commission, 2003).
Good governance	Support good governance in government agencies (National Electronics and Computer Technology Center, 2009; Office of the Public Sector Development Commission, 2003).
High performance	Increase effectiveness of government works (National Electronics and Computer Technology Center, 2009; Office of the Public Sector Development Commission, 2003).
Value for money	Lower cost. Government agencies make cost accounting of each category of public service work in compliance with good governance (National Electronics and Computer Technology Center, 2009; Office of the Public Sector Development Commission, 2003).
Favorable services	Provide favorable services. Government agencies make the delight and good living conditions of people and maintain public order and safety as well as maximize profit of the nation (Office of the Public Sector Development Commission, 2003).
Enhance participation	Allow citizens to involve in government projects and administrative works (National Electronics and Computer Technology Center, 2009; Office of the Public Sector Development Commission, 2003).
Transparent	Government information and works shall be disclosed where appropriated and necessary (National Electronics and Computer Technology Center, 2009; Office of the Public Sector Development Commission, 2003).

APPENDIX C

List of items and descriptions

Construct	Item	Label	Description
Information Quality	Accuracy 1	ACR1	The website provides accurate information.
	Accuracy 2	ACR2	The website provides truthful information.
	Accuracy 3	ACR3	I am satisfied with the accuracy of information presented on the website.
	Completeness 1	CPN1	The website enables me to access adequate information.
	Completeness 2	CPN2	I find information on the website is sufficient for the task at hand.
	Completeness 3	CPN3	Information on the website is complete.
	Relevance 1	REL1	The website enables me to obtain relevant information.
	Relevance 2	REL2	The website enables me to find information that I need.
	Relevance 3	REL3	Information on the website relates to my requirements.
	Security 1	SEC1	I am confident about the security of the website.
	Security 2	SEC2	I feel that my privacy is protected.
	Security 3	SEC3	I feel that the administrators will not misuse my personal information.
	Timeliness 1	TIME1	The information on the website appears to be updated regularly.
	Timeliness 2	TIME2	Using this website enables me to access up-to-date information compared to other sources.
	Timeliness 3	TIME3	Using this website enables me to access the latest information.
	Understandability1	UND1	I find that web pages on the website are well-organized.
	Understandability2	UND2	Information on the website is clear.
	Understandability3	UND3	Information on the website is easy to understand.
System Quality	Dependability 1	DEP1	The website always performs well when I access it.
	Dependability 2	DEP2	The website is available every time I request it.
	Dependability 3	DEP3	When I am navigating the website, I feel that I am in control of what I can do.
	Ease of use 1	EOU1	I can easily log-in to the website.
	Ease of use 2	EOU2	It is easy to get information from the website.
	Ease of use 3	EOU3	The navigation of this website is easy to follow.
	Efficiency 1	EFF1	Gaining access to the website is easy.
	Efficiency 2	EFF2	Using the website enables me to complete the tasks more quickly.
	Efficiency 3	EFF3	Using the website has improved my work productivity by saving time.
	Functionality 1	FUNC1	The website always works correctly.
	Functionality 2	FUNC2	The website provides necessary information for downloading.
	Functionality 3	FUNC3	The website provides necessary forms for downloading.
	Functionality 4	FUNC4	The website provides necessary online transactions.
	Functionality 5	FUNC5	The website provides helpful instructions.
	SystemAvailability1	SYA1	The website is always available.
	SystemAvailability2	SYA2	The website launches immediately.
	SystemAvailability3	SYA3	The website does not crash.
	Usability 1	USA1	I find the website is user-friendly.
	Usability 2	USA2	Finding my way to this website is easy.
	Usability 3	USA3	The website is easy to navigate both forwards and backwards.

Construct	Item	Label	Item statement
	Usefulness 1	UFN1	Using the website enables me to accomplish tasks quickly.
	Usefulness 2	UFN2	Using the website helps me to reduce travelling expenses.
	Usefulness 3	UFN3	Using the website can lower queuing time.
	Usefulness 4	UFN4	The website enables me to do business with the government at anytime, without being limited by office hours.
Service Quality	Assurance 1	ASU1	Government staff members provide perfect responses to convey trust to citizens
	Assurance 2	ASU2	Government staff members provide perfect responses to convey confidence to citizens.
	Assurance 3	ASU3	The government staff members seem to have sufficient knowledge to answer my questions.
	Assurance 4	ASU4	The government staff members seem to have the ability to solve my problem.
	Empathy 1	EMP1	Government staff members respond to my requests in a timely fashion.
	Empathy 2	EMP2	If I send a request via email or web board to the government, I will receive a response from government staff that shows a willingness to help
	Empathy 3	EMP3	If I send a request via email or web board to the government, I will receive a response that shows the friendliness of government staff.
	Reliability 1	REI1	The website performs services as promised without error.
	Reliability 2	REI2	If I send a request via email or web board, I will receive the right solution from government staff.
	Reliability 3	REI3	If I send a request via email or web board, I will receive the right solution that matches my needs from government staff.
	Responsiveness1	RESP1	If I send a request via email or web board, I will receive a prompt response from the government officials.
	Responsiveness2	RESP2	If I have a problem with the websites, a government staff member quickly resolves my problems.
	Responsiveness3	RESP3	Government staff members are keen to help all website users.
	Tangibility 1	TAN1	If I need help, I can find a way to reach a government staff member such as by email or web board on the websites.
	Tangibility 2	TAN2	There is a staff member who responds to my request.
	Tangibility 3	TAN3	The website uses the latest technology.
Participation Quality	Access 1	ACC1	The information on the website meets my needs.
	Access 2	ACC2	The website is accessible 24 hours a day, 7 days week.
	Access 3	ACC3	The website is accessible from anywhere.
	Access 4	ACC4	Gaining access to the portal is easy.
	Accountability 1	ACOU1	Registration on this website is secure.
	Accountability 2	ACOU2	My personal information is well-protected.
	Accountability 3	ACOU3	I am certain that personal information I submit through the website will be used properly by authorized persons.
	Contestability 1	CTA1	This website makes it easy for me to discuss issues with other users or government staff.
	Contestability 2	CTA2	The website enables me to share or exchange information with others.
	Contestability 3	CTA3	I feel that I am free to say anything.

Construct	Item	Label	Description
	Equality 1	EQA1	This website provides everyone a chance to access government information and services.
	Equality 2	EQA2	This website provides everyone a chance to be involved in the political processes.
	Equality 3	EQA3	I have the right to enter all government websites.
	Equality 4	EQA4	I feel that I can exercise my civic obligations through the website.
	Openness 1	OPEN1	This website is available to the public.
	Openness 2	OPEN2	This website provides tools for me to input my ideas and opinions.
	Openness 3	OPEN3	I can share my experience and expertise on government projects and policy-making processes.
	Transparency 1	TPS1	Rules that are related to user comments are clearly stated on the websites such as offensive comments or bad language.
	Transparency 2	TPS2	Rules are easy to find on the website.
	Transparency 3	TPS3	It is easy to follow the rules and regulations on the website.
Net Benefits	Better service quality 1	NB1BS	I feel that this website allows a government agency to perform with greater efficiency.
	Good governance 2	NB2GG	I feel that the website supports good governance in the government agency.
	High performance 3	NB3HP	I feel that the website enables a government agency to achieve its objectives (effectiveness).
	Value for money4	NB4VM	I feel that the website helps to save cost for the government agency.
	Favorable services 5	NB5FS	I feel that the website provides prompt information and services which meet my requirements.
	Enhance participation 6	NB6EP	The website allows me to participate in government projects and administrative works.
	Transparent 7	NB7TP	The website makes me feel that the government agency is transparent.
Use	Use 1	U1	In the future, I would not hesitate to use this website.
	Use 2	U2	In the future, I will consider this website to be my first choice to do business with the government.
	Use 3	U3	In the future, I intend to increase my use of e-government websites.
User satisfaction	User satisfaction 1	US1	Overall, I am satisfied with e-government websites.

APPENDIX D

Pre-test: Comments and Suggestions

Draft questionnaire in Thai and English language were given to highly specify samples for comments and suggestions: four PhD candidates, 1 PhD graduate and 2 academics. Comments and suggestions are;

1. Language
   - 1.1. Recheck with samples if they prefer Thai/English in the same questionnaire or just Thai language. Present two languages might mislead and create confusion. Questionnaire might be too long.
   - 1.2. Explain 'scale' from 1-7 clearly in every section.
2. Dimensions;
   - 2.1. Simplify name of dimensions (word) in Thai language: ด้านข้อมูล ด้านระบบ ด้านการบริการ ด้านการมีส่วนร่วม
   - 2.2. Name of dimensions (word) in Thai language is clear and understandable. Do not include meanings of each dimension in the questionnaire.
   - 2.3. Numbering questions in each dimension separately.
   - 2.4. No need to include item stem in each dimension.
3. Section 2; ask for one website, not three, that users use the most.
4. Items and description;
   - 4.1. Rephrase ambiguous sentences and expand to 2 or more sentences
     - 4.1.1. Functionality (11 and 12 System Quality construct)
     - 4.1.2. Usefulness (22 and 23 in System Quality construct)
     - 4.1.3. Assurance (3 and 4 in Service Quality construct)
     - 4.1.4. Access (3 and 4 in Participation Quality construct)
     - 4.1.5. Equality (12 and 13 in Participation Quality construct)
   - 4.2. Rephrase a question for Net Benefits; "How do you rate the overall benefits **after** using e-government website?"
   - 4.3. Rephrase in 'Net Benefits' both in English language to better clarify and capture the true meanings as follows;
     - 4.3.1. I feel that this website allows a government agency to perform with greater efficiency.
     - 4.3.2. I feel that the website supports good governance in the government agency.
     - 4.3.3. I feel that the website enables a government agency to achieve its objectives (effectiveness).
     - 4.3.4. I feel that the website helps to save cost for the government agency.
     - 4.3.5. I feel that the website provides prompt information and services which meet my requirements.
     - 4.3.6. The website allows me to participate in government projects and administrative works.
     - 4.3.7. The website makes me feel that the government agency is transparent.
5. Suggest sending the questionnaire in English language to Proof Reader, DPU IC, in order to check the proper use of language.

APPENDIX E

Content Validity Ratio (CVR)

Summary of CVR Value

Construct / Item	Rank			CVR Value		
	1	2	3	1	2	3
Information Quality						
Accuracy	-	-	5	-	-	1.00
Completeness	-	-	5	-	-	1.00
Privacy / security	-	-	5	-	-	1.00
Relevance	-	-	5	-	-	1.00
Timeliness	-	-	5	-	-	1.00
Understandability	-	-	5	-	-	1.00
System Quality						
Dependability	-	-	5	-	-	1.00
Ease of use	-	-	5	-	-	1.00
Efficiency	-	-	5	-	-	1.00
Functionality	-	-	5	-	-	1.00
System availability	-	-	5	-	-	1.00
Usability	-	-	5	-	-	1.00
Usefulness	-	-	5	-	-	1.00
Service Quality						
Assurance	-	-	5	-	-	1.00
Empathy	-	1	4	-	-0.60	0.60
Reliability	-	-	5	-	-	1.00
Responsiveness	-	-	5	-	-	1.00
Tangibility	-	1	4	-	-0.60	0.60
Participation Quality						
Access	-	-	5	-	-	1.00
Accountability	-	-	5	-	-	1.00
Contestability	-	-	5	-	-	1.00
Equality	-	-	5	-	-	1.00
Openness	-	-	5	-	-	1.00
Transparency	-	-	5	-	-	1.00

APPENDIX F

Results of Pilot Study

a) Descriptive statistics ($N = 46$)

Construct	Item	Min	Max	Mean	Std. Deviation		Skewness	Kurtosis
Information Quality	(Number of items = 18)			4.566	17.843			
	Accuracy 1	2	7	4.696	1.263		-.776	.405
	Accuracy 2	2	7	4.978	1.164	2.855	-.486	.578
	Accuracy 3	2	7	4.696	1.227		-.137	-.558
	Completeness 1	1	7	4.696	1.364		-.460	-.102
	Completeness 2	1	7	4.435	1.259	3.716	-.755	1.059
	Completeness 3	1	7	4.391	1.341		-.537	.209
	Relevance 1	1	7	4.522	1.260		-.469	.535
	Relevance 2	1	7	4.565	1.328	3.519	-.743	.897
	Relevance 3	1	7	4.630	1.254		-.876	1.153
	Security 1	2	7	4.587	1.257		-.346	-.611
	Security 2	2	7	4.500	1.243	3.279	-.254	-.104
	Security 3	2	7	4.609	1.125		-.528	.338
	Timeliness 1	1	7	4.326	1.351		-.235	.317
	Timeliness 2	2	7	4.391	1.291	3.516	.057	-.210
	Timeliness 3	2	7	4.391	1.308		-.094	-.376
	Understandability 1	1	7	4.500	1.362		-.662	.616
	Understandability 2	1	7	4.630	1.218	3.608	-.704	1.186
	Understandability 3	1	7	4.652	1.269		-.529	.867
System Quality	(Number of items = 24)			4.486	21.978			
	Dependability 1	2	6	4.391	1.000		-.734	.427
	Dependability 2	2	7	4.522	1.005	2.962	-.268	.786
	Dependability 3	1	7	4.457	1.168		-.634	1.038
	Ease of use 1	1	7	4.326	1.194		-1.002	1.634
	Ease of use 2	1	7	4.435	1.223	3.466	-.909	1.449
	Ease of use 3	1	7	4.413	1.408		-.189	-.300
	Efficiency 1	1	7	4.717	1.205		-1.017	1.402
	Efficiency 2	1	7	4.543	1.089	3.100	-.386	2.250
	Efficiency 3	1	6	4.630	1.123		-.785	1.281
	Functionality 1	1	7	4.565	1.088		-.661	1.930
	Functionality 2	1	7	4.652	1.120		-.648	1.275
	Functionality 3	1	7	4.696	1.280	5.092	-.724	.695
	Functionality 4	1	7	4.152	1.520		-.348	-.228
	Functionality 5	1	7	4.326	1.230		-.514	.633
	System availability 1	2	7	4.630	1.082		-.187	.560
	System availability 2	1	6	4.370	1.019	2.964	-.815	1.801
	System availability 3	1	7	4.196	1.240		-.462	.401
	Usability 1	1	6	4.391	1.125		-.744	.942
	Usability 2	1	7	4.587	1.147	3.067	-.500	1.543
	Usability 3	1	6	4.478	1.027		-.968	2.100
	Usefulness 1	1	7	4.370	1.123		-.200	1.548
	Usefulness 2	1	7	4.804	1.360	4.450	-1.069	1.592
	Usefulness 3	1	7	4.826	1.270		-1.155	2.543
	Usefulness 4	1	7	4.196	1.529		-.657	-.231

Construct	Item	Min	Max	Mean	Std. Deviation		Skewness	Kurtosis
Service Quality	(Number of items = 16)			4.154	19.293			
	Assurance 1	1	6	4.130	1.240		-.550	.551
	Assurance 2	1	7	4.043	1.490	5.032	-.499	.082
	Assurance 3	1	6	4.239	1.303		-.971	.783
	Assurance 4	1	7	4.304	1.396		-.575	.028
	Empathy 1	1	6	3.935	1.389		-.503	-.115
	Empathy 2	1	7	4.065	1.237	3.783	-.055	1.052
	Empathy 3	1	6	4.152	1.366		-.834	.533
	Reliability 1	1	7	4.261	1.452		-.251	.272
	Reliability 2	1	6	4.152	1.229	3.798	-.603	.453
	Reliability 3	1	7	4.196	1.344		-.086	.617
	Responsiveness 1	1	6	4.087	1.279		-.369	-.043
	Responsiveness 2	1	7	4.065	1.389	3.907	.191	.277
	Responsiveness 3	1	7	4.109	1.386		-.203	-.274
	Tangibility 1	1	7	4.174	1.435		-.036	.005
	Tangibility 2	1	7	4.043	1.382	3.851	-.134	-.343
	Tangibility 3	1	7	4.500	1.329		-.356	.344
Participation Quality	(Number of items = 20)			4.386	20.576			
	Access 1	1	7	4.304	1.209		-.859	1.413
	Access 2	2	7	4.761	1.119	3.886	-.297	.646
	Access 3	2	7	4.739	1.084		-.106	.839
	Access 4	2	7	4.652	1.140		-.394	.915
	Accountability 1	2	6	4.326	1.212		-.356	-.483
	Accountability 2	1	7	4.261	1.405	3.641	-.489	-.109
	Accountability 3	1	6	4.065	1.200		-.695	.228
	Contestability 1	2	7	4.239	1.214		-.094	-.211
	Contestability 2	1	6	4.196	1.258	3.710	-.737	.416
	Contestability 3	1	7	4.109	1.479		-.540	-.003
	Equality 1	1	7	4.609	1.164		-.938	1.539
	Equality 2	1	7	4.217	1.348	4.445	-.472	.261
	Equality 3	2	7	4.717	1.148		-.240	.362
	Equality 4	1	7	4.435	1.393		-.736	.515
	Openness 1	1	7	4.717	1.344		-.832	.858
	Openness 2	1	7	4.239	1.320	3.483	-.645	.465
	Openness 3	1	6	4.196	1.344		-.834	.438
	Transparency 1	1	7	4.196	1.240		-.316	.300
	Transparency 2	1	7	4.326	1.317	3.690	-.457	-.115
	Transparency 3	1	7	4.413	1.343		-.698	.575
Net Benefits	(Number of items = 7)			4.230	8.780			
	Better service quality 1	1	6	4.196	1.360		-1.036	.779
	Good governance 2	1	7	4.239	1.286		-.601	.656
	High performance 3	1	6	4.239	1.369		-.997	.743
	Value for money 4	2	7	4.391	1.125	8.780	-.548	.264
	Favorable services 5	1	6	4.283	1.530		-.930	.091
	Enhance participation 6	1	7	4.152	1.414		-.479	.107
	Transparent 7	1	6	4.109	1.494		-.779	-.039

Construct	Item	Min	Max	Mean	Std. Deviation		Skewness	Kurtosis
Use	(Number of items = 3)			4.377	4.097			
	Use 1	1	6	4.283	1.361		-.707	-.001
	Use 2	1	7	4.174	1.510	4.097	-.268	-.022
	Use 3	1	7	4.674	1.506		-1.003	1.075
User Satisfaction	(Number of items = 1)			4.330	1.383		-.780	.585

Note: Standard error of Skewness = 0.350, Kurtosis = 0.688

b) List of websites respondents visit the most ($N = 46$)

	Website	Frequency	%
1	Tourism Authority of Thailand	9	19.57
2	Revenue Department	5	10.87
3	Disaster Prevention and Mitigation Nonthaburi Provincial Office	3	6.52
4	State Railway of Thailand	3	6.52
5	The Government Lottery Office	3	6.52
6	Office of Higher Education Commission	2	4.35
7	Social Security Office	2	4.35
8	Student Loan	2	4.35
9	Airports of Thailand Public Company Limited	1	2.17
10	Bureau of Tourism Business and Guide Registration	1	2.17
11	Department of Industrial Promotion	1	2.17
12	Government Information Center 1111	1	2.17
13	Government Savings Bank	1	2.17
14	Krung Thai Bank Public Company Limited	1	2.17
15	Lam Sam Kaeo Municipal Office, Pathumthani	1	2.17
16	Metropolitan Electricity Authority	1	2.17
17	Ministry of Commerce	1	2.17
18	Ministry of Energy	1	2.17
19	Ministry of Public Health	1	2.17
20	National Library of Thailand	1	2.17
21	Office of Insurance Commission	1	2.17
22	Public Relations Department	1	2.17
23	Student Loan	1	2.17
24	ThaiGov.Net	1	2.17

APPENDIX G

Evaluation of Thai e-government websites

Part 1: General information

1. Gender: ❑ Female ❑ Male

2. Age: ❑ 20 or under ❑ 21-30 ❑ 31-40
❑ 41-50 ❑ 51-60 ❑ Over 60

3. Education: ❑ High School ❑ Certificate / Diploma
❑ Undergraduate ❑ Postgraduate
❑ Other (please specify): _____

4. Career: ❑ Government Office ❑ State Enterprise Officer ❑ Employee
❑ Student ❑ Business Owner
❑ Other (please specify): _____

Part 2: Name of government websites you often use: _____

Part 3: How do you assess your satisfaction of the following factors?

3.1 Information
(1 = highly dissatisfy, 2 = dissatisfy, 3 = slightly dissatisfy, 4 = neutral, 5 = slightly satisfy, 6 = satisfy, 7 = highly satisfy)

	Description	1	2	3	4	5	6	7
1	The website provides accurate information.							
2	The website provides truthful information.							
3	I am satisfied with the accuracy of information presented on the website.							
4	The website enables me to access adequate information.							
5	I find information on the website is sufficient for the task at hand.							
6	Information on the website is complete.							
7	The website enables me to obtain relevant information.							
8	The website enables me to find information that I need.							
9	Information on the website relates to my requirements.							
10	I am confident about the security of the website.							
11	I feel that my privacy is protected.							
12	I feel that the administrators will not misuse my personal information.							
13	The information on the website appears to be updated regularly.							
14	Using this website enables me to access up-to-date information compared to other sources.							
15	Using this website enables me to access the latest information.							
16	I find that web pages on the website are well-organized.							
17	Information on the website is clear.							
18	Information on the website is easy to understand.							

3.2 System

(1 = highly dissatisfy, 2 = dissatisfy, 3 = slightly dissatisfy, 4 = neutral, 5 = slightly satisfy, 6 = satisfy, 7 = highly satisfy)

	Description	1	2	3	4	5	6	7
1	The website always performs well when I access it.							
2	The website is available every time I request it.							
3	When I am navigating the website, I feel that I am in control of what I can do.							
4	I can easily log-in to the website.							
5	It is easy to get information from the website.							
6	The navigation of this website is easy to follow.							
7	Gaining access to the website is easy.							
8	Using the website enables me to complete the tasks more quickly.							
9	Using the website has improved my work productivity by saving time.							
10	The website always works correctly.							
11	The website provides necessary information for downloading.							
12	The website provides necessary forms for downloading.							
13	The website provides necessary online transactions.							
14	The website provides helpful instructions.							
15	The website is always available.							
16	The website launches immediately.							
17	The website does not crash.							
18	I find the website is user-friendly.							
19	Finding my way to this website is easy.							
20	The website is easy to navigate both forwards and backwards.							
21	Using the website enables me to accomplish tasks quickly.							
22	Using the website helps me to reduce travelling expenses.							
23	Using the website can lower queuing time.							
24	The website enables me to do business with the government at anytime, without being limited by office hours.							

3.3 Services

(1 = highly dissatisfy, 2 = dissatisfy, 3 = slightly dissatisfy, 4 = neutral, 5 = slightly satisfy, 6 = satisfy, 7 = highly satisfy)

	Description	1	2	3	4	5	6	7
1	Government staff members provide perfect responses to convey trust to citizens.							
2	Government staff members provide perfect responses to convey confidence to citizens.							
3	The government staff members seem to have sufficient knowledge to answer my questions.							
4	The government staff members seem to have the ability to solve my problem.							
5	Government staff members respond to my requests in a timely fashion.							
6	If I send a request via email or web board to the government, I will receive a response from government staff that shows a willingness to help.							
7	If I send a request via email or web board to the government, I will receive a response that shows the friendliness of government staff.							

	Description	1	2	3	4	5	6	7
8	The website performs services as promised without error.							
9	If I send a request via email or web board, I will receive the right solution from government staff.							
10	If I send a request via email or web board, I will receive the right solution that matches my needs from government staff.							
11	If I send a request via email or web board, I will receive a prompt response from the government officials.							
12	If I have a problem with the websites, a government staff member quickly resolves my problems.							
13	Government staff members are keen to help all website users.							
14	If I need help, I can find a way to reach a government staff member such as by email or web board on the websites.							
15	There is a staff member who responds to my request.							
16	The website uses the latest technology.							

3.4 Participation

(1 = highly dissatisfy, 2 = dissatisfy, 3 = slightly dissatisfy, 4 = neutral, 5 = slightly satisfy, 6 = satisfy, 7 = highly satisfy)

	Description	1	2	3	4	5	6	7
1	The information on the website meets my needs.							
2	The website is accessible 24 hours a day, 7 days week.							
3	The website is accessible from anywhere.							
4	Gaining access to the portal is easy.							
5	Registration on this website is secure.							
6	My personal information is well-protected.							
7	I am certain that personal information I submit through the website will be used properly by authorized persons.							
8	This website makes it easy for me to discuss issues with other users or government staff.							
9	The website enables me to share or exchange information with others.							
10	I feel that I am free to say anything.							
11	This website provides everyone a chance to access government information and services.							
12	This website provides everyone a chance to be involved in the political processes.							
13	I have the right to enter all government websites.							
14	I feel that I can exercise my civic obligations through the website.							
15	This website is available to the public.							
16	This website provides tools for me to input my ideas and opinions.							
17	I can share my experience and expertise on government projects and policy-making processes.							
18	Rules that are related to user comments are clearly stated on the websites such as offensive comments or bad language.							
19	Rules are easy to find on the website.							
20	It is easy to follow the rules and regulations on the website.							

3.5 Level of Benefits

How do you rate the overall benefits after using e-government website?

(1 = strongly disagree, 2 = disagree, 3 = slightly disagree, 4 = neutral, 5 = slightly agree, 6 = agree, 7 = strongly agree)

	Description	1	2	3	4	5	6	7
1	I feel that this website allows a government agency to perform with greater efficiency.							
2	I feel that the website supports good governance in the government agency.							
3	I feel that the website enables a government agency to achieve its objectives (effectiveness).							
4	I feel that the website helps to save cost for the government agency.							
5	I feel that the website provides prompt information and services which meet my requirements.							
6	The website allows me to participate in government projects and administrative works.							
7	The website makes me feel that the government agency is transparent.							

3.6 Overall Assessment

How do you rate the overall intention and satisfaction of using an e-government website?

(1 = strongly disagree, 2 = disagree, 3 = slightly disagree, 4 = neutral, 5 = slightly agree, 6 = agree, 7 = strongly agree)

	Description	1	2	3	4	5	6	7
1	In the future, I would not hesitate to use this website.							
2	In the future, I will consider this website to be my first choice to do business with the government.							
3	In the future, I intend to increase my use of e-government websites.							
4	Overall, I am satisfied with e-government websites.							

Thank you for your time and efforts.

APPENDIX H

Results of the Main Study

a) Non-response bias using Levene's Test for Equality of Variances ($N = 457$)

Item	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Accuracy 1	2.688	0.102	-0.546	455	0.585	-0.064	0.117	-0.295	0.166
Accuracy 2	3.462	0.063	0.473	455	0.636	0.052	0.111	-0.165	0.27
Accuracy 3	1.413	0.235	-0.501	455	0.617	-0.056	0.111	-0.275	0.163
Completeness 1	0.348	0.555	1.009	455	0.313	0.123	0.122	-0.117	0.363
Completeness 2	0.062	0.804	1.006	455	0.315	0.127	0.126	-0.121	0.375
Completeness 3	1.084	0.298	0.749	455	0.454	0.091	0.121	-0.147	0.328
Relevance 1	0.15	0.699	0.399	455	0.69	0.047	0.119	-0.186	0.281
Relevance 2	1.341	0.248	1.124	455	0.261	0.127	0.113	-0.095	0.348
Relevance 3	0.209	0.648	0.775	455	0.439	0.083	0.107	-0.127	0.293
Security 1	0.12	0.73	0.146	455	0.884	0.017	0.117	-0.214	0.248
Security 2	0	0.992	0.018	455	0.986	0.002	0.114	-0.223	0.227
Security 3	0.714	0.398	-0.109	455	0.913	-0.011	0.104	-0.215	0.193
Timeliness 1	0.021	0.885	-0.259	455	0.796	-0.035	0.134	-0.299	0.229
Timeliness 2	0.245	0.621	-1.212	455	0.226	-0.156	0.129	-0.409	0.097
Timeliness 3	0.519	0.472	0.449	455	0.654	0.062	0.138	-0.209	0.332
Understandability 1	1.191	0.276	-0.707	455	0.48	-0.089	0.126	-0.337	0.159
Understandability 2	0.016	0.901	0.235	455	0.814	0.028	0.121	-0.209	0.266
Understandability 3	2.012	0.157	0.329	455	0.742	0.038	0.116	-0.189	0.266
Dependability 1	2.091	0.149	0.605	455	0.545	0.069	0.114	-0.155	0.294
Dependability 2	1.245	0.265	0.732	455	0.465	0.085	0.116	-0.143	0.313
Dependability 3	1.104	0.294	-0.541	455	0.589	-0.06	0.111	-0.279	0.158
Ease of use 1	0.242	0.623	0.619	455	0.536	0.07	0.114	-0.153	0.294
Ease of use 2	0.028	0.867	-0.075	455	0.94	-0.009	0.119	-0.244	0.226
Ease of use 3	0.349	0.555	0.359	455	0.72	0.044	0.122	-0.196	0.283
Efficiency 1	0.046	0.831	-0.089	455	0.929	-0.01	0.114	-0.235	0.214
Efficiency 2	0.01	0.92	0.043	455	0.965	0.005	0.107	-0.206	0.215
Efficiency 3	0.499	0.48	1.512	455	0.131	0.172	0.114	-0.052	0.396
Functionality 1	0.416	0.519	0.004	455	0.996	0.001	0.116	-0.228	0.229
Functionality 2	0.109	0.741	0.614	455	0.539	0.072	0.118	-0.159	0.303
Functionality 3	0.131	0.717	0.962	455	0.336	0.109	0.113	-0.113	0.331
Functionality 4	1.414	0.235	0.758	455	0.449	0.106	0.139	-0.168	0.379
Functionality 5	1.815	0.179	0.601	455	0.548	0.073	0.121	-0.165	0.31
System availability 1	0.84	0.36	0.07	455	0.944	0.009	0.122	-0.231	0.248
System availability 2	1.541	0.215	0.298	455	0.766	0.034	0.116	-0.193	0.262
System availability 3	2.464	0.117	1.063	455	0.288	0.136	0.128	-0.116	0.389
Usability 1	0.928	0.336	0.19	455	0.849	0.021	0.112	-0.199	0.241
Usability 2	0.679	0.41	0.356	455	0.722	0.039	0.11	-0.178	0.256
Usability 3	0.003	0.958	0.424	455	0.672	0.048	0.113	-0.174	0.269

Item	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Usefulness 1	1.508	0.22	0.633	455	0.527	0.071	0.113	-0.15	0.293
Usefulness 2	0.045	0.831	0.052	455	0.959	0.006	0.121	-0.231	0.244
Usefulness 3	0.05	0.823	1.663	455	0.097	0.191	0.115	-0.035	0.417
Usefulness 4	0.151	0.698	0.552	455	0.581	0.073	0.133	-0.188	0.334
Assurance 1	0.382	0.537	-0.296	455	0.767	-0.03	0.103	-0.233	0.172
Assurance 2	0.019	0.89	-0.325	455	0.745	-0.036	0.11	-0.252	0.181
Assurance 3	0.014	0.905	-0.47	455	0.639	-0.051	0.11	-0.267	0.164
Assurance 4	0.033	0.857	-0.211	455	0.833	-0.024	0.114	-0.248	0.2
Empathy 1	0.164	0.685	0.282	455	0.778	0.034	0.119	-0.201	0.268
Empathy 2	0.127	0.721	-0.01	455	0.992	-0.001	0.124	-0.244	0.242
Empathy 3	1.441	0.231	-0.285	455	0.776	-0.033	0.115	-0.259	0.193
Reliability 1	0.601	0.439	0.123	455	0.902	0.014	0.111	-0.204	0.231
Reliability 2	0.864	0.353	-0.613	455	0.54	-0.066	0.108	-0.279	0.146
Reliability 3	0.041	0.84	0.579	455	0.563	0.065	0.113	-0.157	0.288
Responsiveness 1	0.163	0.686	-1.019	455	0.309	-0.121	0.118	-0.353	0.112
Responsiveness 2	0.535	0.465	-0.844	455	0.399	-0.104	0.123	-0.345	0.138
Responsiveness 3	0.039	0.843	-0.49	455	0.625	-0.062	0.127	-0.312	0.187
Tangibility 1	0.596	0.441	0.587	455	0.557	0.073	0.125	-0.172	0.319
Tangibility 2	0	0.988	-0.026	455	0.979	-0.003	0.12	-0.239	0.232
Tangibility 3	0.156	0.693	0.51	455	0.611	0.062	0.122	-0.177	0.301
Access 1	0.164	0.686	-0.22	455	0.826	-0.025	0.116	-0.253	0.202
Access 2	1.55	0.214	-0.901	455	0.368	-0.102	0.113	-0.324	0.12
Access 3	0.076	0.782	-0.305	455	0.761	-0.033	0.107	-0.243	0.178
Access 4	0.491	0.484	0.367	455	0.714	0.041	0.113	-0.18	0.263
Accountability 1	0.231	0.631	-1.753	455	0.08	-0.186	0.106	-0.395	0.023
Accountability 2	0.024	0.876	-1.538	455	0.125	-0.175	0.114	-0.399	0.049
Accountability 3	0.077	0.782	-1.383	455	0.167	-0.155	0.112	-0.375	0.065
Contestability 1	0.042	0.838	-1.112	455	0.267	-0.121	0.109	-0.336	0.093
Contestability 2	0.164	0.686	-1.005	455	0.315	-0.108	0.108	-0.319	0.103
Contestability 3	2.429	0.12	-1.1	455	0.272	-0.135	0.122	-0.375	0.106
Equality 1	0.202	0.653	-0.11	455	0.912	-0.013	0.114	-0.237	0.212
Equality 2	0.189	0.664	-1.159	455	0.247	-0.137	0.118	-0.369	0.095
Equality 3	0.173	0.678	-0.102	455	0.919	-0.012	0.114	-0.235	0.212
Equality 4	1.414	0.235	0.022	455	0.983	0.003	0.116	-0.225	0.23
Openness 1	0.258	0.612	0.224	455	0.823	0.025	0.111	-0.194	0.244
Openness 2	1.041	0.308	-0.616	455	0.538	-0.072	0.116	-0.3	0.157
Openness 3	0.723	0.396	-0.385	455	0.7	-0.046	0.119	-0.279	0.188
Transparency 1	0.43	0.512	0.316	455	0.752	0.034	0.109	-0.18	0.248
Transparency 2	0.201	0.654	0.298	455	0.766	0.034	0.114	-0.19	0.257
Transparency 3	0.003	0.96	-0.148	455	0.882	-0.016	0.106	-0.224	0.193
Better service quality1	1.916	0.167	-0.123	455	0.902	-0.014	0.118	-0.246	0.217
Good governance2	1.626	0.203	1.042	455	0.298	0.12	0.115	-0.106	0.345
High performance3	2.371	0.124	-0.403	455	0.687	-0.046	0.115	-0.272	0.179
Value for money4	0.374	0.541	1.129	455	0.259	0.125	0.111	-0.093	0.343
Favorable services5	1.456	0.228	-0.082	455	0.935	-0.01	0.118	-0.241	0.222

Item	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Enhance participation6	0.015	0.904	-0.223	455	0.824	-0.028	0.126	-0.276	0.22
Transparent7	1.951	0.163	-0.79	455	0.43	-0.099	0.126	-0.347	0.148
Use 1	0.034	0.854	-0.698	455	0.485	-0.086	0.123	-0.327	0.156
Use 2	0.18	0.671	-0.101	455	0.92	-0.013	0.131	-0.271	0.244
Use 3	0.022	0.881	0.504	455	0.614	0.061	0.121	-0.177	0.299
User satisfaction 1	0.387	0.534	0.136	455	0.892	0.016	0.119	-0.217	0.25
Gender	3.207	0.074	0.919	455	0.359	0.042	0.046	-0.048	0.133
Age	0.011	0.917	0.943	455	0.346	0.085	0.091	-0.093	0.263
Education	0.062	0.804	-0.849	455	0.397	-0.06	0.071	-0.199	0.079
Career	6.31	0.012	1.555	455	0.121	0.221	0.142	-0.058	0.499

b) List of Thai government websites that respondents visit most often ($N = 457$)

	Website of Thai government agency	Frequency	Percentage (%)
1	Revenue Department	97	21.23
2	Ministry of Foreign Affairs	24	5.25
3	Government Lottery Office	21	4.60
4	Tourism Authority of Thailand	18	3.94
5	Kasetsart University	14	3.06
6	Bank of Thailand	12	2.63
7	Department of Business Development	11	2.41
8	Department of Local Administration	8	1.75
9	Department of Lands	7	1.53
10	Ministry of Labor	7	1.53
11	Disaster Prevention and Mitigation Nonthaburi Provincial Office	6	1.31
12	Government Savings Bank	6	1.31
13	Student Loan	6	1.31
14	Chulalongkorn University	5	1.09
15	Department of Consular Affairs of Thailand	5	1.09
16	Local Administration Office	5	1.09
17	Social Security Office	5	1.09
18	State Railway of Thailand	5	1.09
19	Thai Meteorological Department	5	1.09
20	Ministry of Education	4	0.88
21	Office of Higher Education Commission	4	0.88
22	Ramkhamhaeng University	4	0.88
23	Thai Tambon (One Tambon One Product)	4	0.88
24	Thai Telecenter	4	0.88
25	Board of Investment	3	0.66
26	Department of Land Transport	3	0.66
27	Electronic Government Agency	3	0.66
28	Immigration Bureau	3	0.66
29	Ministry of Information and Communication Technology	3	0.66

	Website of Thai government agency (cont.)	Frequency	Percentage (%)
30	Ministry of Social Development and Human Security	3	0.66
31	National Statistical Office	3	0.66
32	Office of the Council of State of Thailand	3	0.66
33	Royal Thai Government	3	0.66
34	Singburi Primary Education Area Office	3	0.66
35	Sukhothai Primary Education Area Office 2	3	0.66
36	Thai Government News Center	3	0.66
37	Thailand Post	3	0.66
38	Udon Thani Rajabhat University	3	0.66
39	Bansomdej Chaophraya Rajabhat University	2	0.44
40	Burapha University	2	0.44
41	Bureau of Tourism Business and Guide Registration	2	0.44
42	Center for Continuing Nursing Education	2	0.44
43	Chandrakasem Rajabhat University	2	0.44
44	Chiang Mai University	2	0.44
45	Department of Export	2	0.44
46	Department of Foreign Trade	2	0.44
47	Department of Industrial Promotion	2	0.44
48	Department of Industrial Works	2	0.44
49	Department of Internal Trade	2	0.44
50	Department of Provincial Administration	2	0.44
51	Electricity Generating Authority of Thailand	2	0.44
52	Government Information Center 1111	2	0.44
53	Khon Kaen University	2	0.44
54	King Mongkut's University of Technology North Bangkok	2	0.44
55	Metropolitan Electricity Authority	2	0.44
56	Ministry of Commerce	2	0.44
57	Ministry of Energy	2	0.44
58	Ministry of Public Health	2	0.44
59	Nakorn Ratchasima Primary Education Area Office 3	2	0.44
60	National Library of Thailand	2	0.44
61	Office of Insurance Commission	2	0.44
62	Office of the Basic Education Commission	2	0.44
63	Office of the Civil Service Commission	2	0.44
64	Office of the Non-formal and Informal Education	2	0.44
65	Office of the Private Education Commission	2	0.44
66	Public Relations Department	2	0.44
67	Rajamangala University of Technology Thanyaburi	2	0.44
68	Royal Irrigation Department	2	0.44
69	Suankularb Wittayalai Rangsit School	2	0.44
70	Thai Government Procurement	2	0.44
71	ThaiGov.Net	2	0.44
72	The Royal Institute	2	0.44
73	The Teacher's Council of Thailand	2	0.44
74	Airports of Thailand Public Company Limited	1	0.22
75	Base Brain of Research	1	0.22
76	Bureau of the Budget	1	0.22

	Website of Thai government agency	Frequency	Percentage (%)
77	Department of Intellectual Property	1	0.22
78	Krung Thai Bank Public Company Limited	1	0.22
79	Lam Sam Kaeo Municipal Office, Pathumthani	1	0.22
80	National Health Security Office	1	0.22
81	Office of the Higher Education Commission	1	0.22
82	Royal Thai Police	1	0.22
83	Securities and Exchange Commission	1	0.22
84	Sukhothai Thammathirat Open University	1	0.22

APPENDIX I

Summary of correlations of indicators and constructs from exploratory assessment

a) Information Quality construct

	ACR2	ACR3	CPN1	CPN2	CPN3	REL2	REL3	SEC1	SEC3	TIME2	TIME3	UND2	UND3
Accuracy 2	1.000												
Accuracy 3	0.762	1.000											
Completeness 1	0.569	0.685	1.000										
Completeness 2	0.561	0.655	0.833	1.000									
Completeness 3	0.555	0.569	0.679	0.755	1.000								
Relevance 2	0.568	0.579	0.726	0.695	0.699	1.000							
Relevance 3	0.593	0.578	0.666	0.680	0.648	0.733	1.000						
Security 1	0.492	0.488	0.533	0.543	0.459	0.486	0.582	1.000					
Security 3	0.441	0.421	0.472	0.465	0.467	0.433	0.437	0.594	1.000				
Timeliness 2	0.415	0.491	0.631	0.580	0.483	0.545	0.549	0.505	0.470	1.000			
Timeliness 3	0.486	0.481	0.591	0.553	0.507	0.547	0.544	0.529	0.450	0.822	1.000		
Understandability 2	0.628	0.586	0.674	0.669	0.629	0.682	0.636	0.561	0.494	0.620	0.696	1.000	
Understandability 3	0.485	0.500	0.593	0.621	0.555	0.603	0.601	0.508	0.514	0.638	0.598	0.832	1.000

b) System Quality construct

	DPN1	DPN2	EOU1	EOU3	EFF1	EFF3	FUNC1	FUNC2	SYA2	SYA3	USA1	USA2	USA3	UFN2	UFN3
Dependability 1	1.000														
Dependability 2	0.888	1.000													
Ease of use 1	0.655	0.693	1.000												
Ease of use 3	0.645	0.647	0.637	1.000											
Efficiency 1	0.697	0.728	0.719	0.731	1.000										
Efficiency 3	0.574	0.572	0.544	0.638	0.643	1.000									
Functionality 1	0.610	0.584	0.594	0.565	0.695	0.729	1.000								
Functionality 2	0.505	0.497	0.586	0.546	0.572	0.520	0.603	1.000							
System availability 2	0.630	0.648	0.621	0.651	0.602	0.694	0.655	0.571	1.000						
System availability 3	0.697	0.732	0.589	0.585	0.622	0.458	0.551	0.485	0.672	1.000					
Usability 1	0.671	0.666	0.600	0.672	0.612	0.650	0.669	0.547	0.749	0.666	1.000				
Usability 2	0.686	0.675	0.581	0.562	0.650	0.660	0.705	0.489	0.716	0.637	0.860	1.000			
Usability 3	0.653	0.658	0.597	0.661	0.654	0.612	0.625	0.530	0.687	0.620	0.763	0.760	1.000		
Usefulness 2	0.472	0.432	0.393	0.450	0.459	0.537	0.495	0.421	0.475	0.394	0.472	0.491	0.444	1.000	
Usefulness 3	0.508	0.488	0.440	0.463	0.488	0.554	0.476	0.472	0.458	0.444	0.496	0.530	0.509	0.784	1.000

c) Service Quality construct

	ASU1	ASU2	ASU3	ASU4	EMP1	EMP2	EMP3	REI2	REI3	RESP1	RESP2	RESP3	TAN1	TAN2	TAN3
Assurance 1	1.000														
Assurance 2	0.929	1.000													
Assurance 3	0.718	0.731	1.000												
Assurance 4	0.684	0.719	0.885	1.000											
Empathy 1	0.674	0.715	0.796	0.830	1.000										
Empathy 2	0.618	0.665	0.735	0.804	0.799	1.000									
Empathy 3	0.624	0.670	0.779	0.795	0.787	0.870	1.000								
Reliability 2	0.630	0.661	0.711	0.740	0.739	0.780	0.799	1.000							
Reliability 3	0.624	0.640	0.673	0.724	0.737	0.783	0.764	0.885	1.000						
Responsiveness 1	0.604	0.600	0.690	0.738	0.731	0.765	0.763	0.799	0.851	1.000					
Responsiveness 2	0.553	0.595	0.709	0.751	0.734	0.803	0.765	0.832	0.802	0.854	1.000				
Responsiveness 3	0.562	0.600	0.708	0.762	0.752	0.780	0.760	0.838	0.784	0.798	0.906	1.000			
Tangibility 1	0.591	0.615	0.708	0.750	0.733	0.761	0.775	0.840	0.817	0.790	0.860	0.865	1.000		
Tangibility 2	0.610	0.610	0.719	0.751	0.731	0.756	0.731	0.818	0.820	0.836	0.855	0.852	0.869	1.000	
Tangibility 3	0.546	0.586	0.571	0.593	0.567	0.578	0.621	0.633	0.636	0.606	0.575	0.549	0.571	0.595	1.000

d) Participation Quality construct

	ACC1	ACC3	ACOU2	ACOU3	CTA1	CTA3	EQA3	EQA4	OPEN2	OPEN3	TPS1	TPS2
Access 1	1.000											
Access 3	0.649	1.000										
Accountability 2	0.413	0.436	1.000									
Accountability 3	0.515	0.489	0.810	1.000								
Contestability 1	0.417	0.381	0.723	0.769	1.000							
Contestability 3	0.366	0.288	0.603	0.652	0.799	1.000						
Equality 3	0.352	0.368	0.583	0.570	0.584	0.512	1.000					
Equality 4	0.407	0.356	0.604	0.576	0.596	0.577	0.659	1.000				
Openness 2	0.355	0.274	0.552	0.569	0.715	0.717	0.615	0.641	1.000			
Openness 3	0.295	0.211	0.510	0.495	0.630	0.713	0.498	0.649	0.794	1.000		
Transparency 1	0.317	0.266	0.549	0.588	0.692	0.629	0.535	0.579	0.766	0.694	1.000	
Transparency 2	0.377	0.214	0.566	0.545	0.646	0.638	0.560	0.596	0.737	0.717	0.741	1.000

e) Net Benefits construct (Endogenous variable)

	NB1	NB2	NB3	NB4	NB5	NB6	NB7
Better service quality 1	1.000						
Good governance 2	0.788	1.000					
High performance 3	0.810	0.741	1.000				
Value for money 4	0.763	0.686	0.791	1.000			
Favorable services 5	0.773	0.720	0.814	0.791	1.000		
Enhance participation 6	0.608	0.692	0.599	0.605	0.633	1.000	
Transparent 7	0.654	0.749	0.638	0.626	0.714	0.726	1.000

f) Use construct (Endogenous variable)

	U1	U2	U3
Use 1	1.000		
Use 2	0.811	1.000	
Use 3	0.763	0.780	1.000