# CRITICAL FACTORS INFLUENCING ICT ADOPTION WITHIN A THAILAND GOVERNMENT DEPARTMENT

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## DECLARATION

"I, Wanamina Waehama, declare that the Doctor of Business Administration thesis entitled 'Critical Factors Influencing ICT Adoption within a Thailand Government Department' is no more than 65,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work".

Wanamina Waehama

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## ABSTRACT

An increasing need for service efficiency has influenced the need for the adoption of e-government across all governmental departments and agencies. However, in many developing countries such initiatives face numerous challenges, which slowed their implementation down or reduced their effectiveness. This study assessed factors influencing the adoption of the Government Fiscal Management Information System (GFMIS), a Thai e-government initiative, by the employees of the Ministry of Agriculture and Cooperatives (MOAC). Identification of such inhibitory factors may be used to reduce their influence on use of the GFMIS in the MOAC, and more generally, be used to improve performance of similar existing Thai e-government initiatives and improve adoption of future ones.

An extended model was devised based on the Unified Theory of Acceptance and Use of Technology (UTAUT) devised by Ventakesh et al. 2003. This model was empirically tested using structural equation modelling (SEM) analysis with responses from a usable sample size of 315 (after deleting univariate and multivariate outliers, and excluding incomplete responses). SEM analysis on the Extended UTAUT model showed a poor fit. A modified version of the original UTAUT, the Adapted Original UTAUT, was tested in the same way and found to have a good fit.

Path analysis of the Adapted Original UTAUT model showed a number of differences from the Original UTAUT model it was modified from. The Effort Expectancy construct had no significant effects on either Intention to Use Future Technologies or Use Behaviour. Since the effects of this construct are widely reported to decrease with experience of the system, this may indicate that the employees have become used to the GFMIS since its introduction in 2007. The Facilitating Conditions and Performance Expectancy constructs had significant positive influences on both Intention to Use Future Technologies and Use Behaviour. Oddly, the Social Influence construct had a significant positive effect on Intention to Use New Technologies while having a significant negative effect on Use Behaviour. This, combined with the lack of a significant relationship between the Intention to Use Future Technologies and the Use Behaviour constructs, suggests that there may be a gap between what employees of the MOAC say about the GFMIS and how they make use of it.

Non-parametric tests showed Age, Gender and Education Level of respondents moderated the effects of the Social Influence construct. Similar tests showed that Age and Education Level of respondents moderated the effects of the Facilitating Conditions construct (which has a significant positive effect on both Intention to Use Future Technologies and Use Behaviour). None of the demographic factors moderated the effects of the Performance Expectancy construct, suggesting that the benefits of using the GFMIS are accepted by all employees.

Regardless of the details learned about hesitancy in future research; workshops and training sessions to ameliorate problems are in order immediately. Educational aids need to be of high quality and continuous, which will enhance the integration of GFMIS into Thailand's e-government system.

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| | |
|---|---|
| AGTIF | Australian Government Technical Interoperability Framework |
| AMOS | Analysis of Moment Structures |
| ANT | Actor-Network Theory |
| B2B | Business-to-Business |
| B2C | Business to Customer |
| CD | Country Development |
| CDP-G | Country Development Partnership: Governance |
| CGD | Comptroller General Department |
| C-TAM-TPB | combined TAM and TPB |
| DIF | Denmark Interoperability Framework |
| DOI | Diffusion of Innovations Theory |
| DTPB | Decomposed Theory of Planned Behaviour () |
| EDI | Electronic Data Interchange |
| EPI | electronic Participation Index |
| e-banking | electronic banking |
| e-pension | electronic pension |
| e-government | electronic government |
| e-ID | electronic identification |
| EGDI | e-government Development Index (EGDI) |
| e-PING | Government Interoperability Frameworks |
| EKENG | e-Governance Infrastructure Implementation Operator in Armenia |
| GFI | Goodness-of-Fit |
| GFMIS | Government Fiscal Management Information System |
| GNI | Gross National Index |
| HCI | Human Capital Index |
| HRM | Human Resources Management |
| ICT | Information and Communications Technology |

| | |
|---|---|
| IT | Information Technology |
| ITS | Information Technology Systems |
| MCIT | Ministry of Communication and Information Technology |
| MM | Motivational Model |
| MOF | Ministry of Finance |
| MPCU | Model of Personal Computer Utilisation |
| Nectec | National Electronics and Computer Technology Centre |
| NLA | National Legislative Assembly |
| OSI | Online Service Index |
| PBCJ | Perceived Behavioural Control |
| PC | Model of Perceived Consequences |
| PEOU | Perceived Ease of Use |
| PU | Perceived Usefulness |
| Q | Question |
| SCT | Social Cognitive Theory |
| SE Asia | Southeast Asia |
| SEM | Structural equation modelling |
| SMS | text messaging |
| TAM | Technology Acceptance Model |
| TPB | Theory of Planned Behaviours |
| TRA | Theory of Reasoned Action |
| TII | Telecommunications Infrastructure Index |
| UN | United Nations |
| UNDESA | United Nations Department of Economics and Social Affairs |
| UTAUT | Unified Theory of Acceptance and Use of Technology |

Statistical Analysis Acronyms

| | |
|---|---|
| AGI | Adjusted Goodness |
| AGFI | Adjusted Goodness to Fit Index |
| AIC | Akaike's Information Criterions |
| AMOS | Analysis of Moment Structures |

| | |
|---|---|
| ANOVA | Analysis of Variance |
| AVE | Average Variance Extracted |
| CFA | Confirmatory factor analysis |
| CFI | Comparative Fit Index |
| df | Degree(s) of freedom |
| GFI | Goodness to Fit Index (or Indices) |
| GOF | Goodness of Fit |
| NFI | Normed Fit Index |
| NNFI | Non-normed fit index |
| PGFI | Parsimonious GFI |
| PNFI | Parsimonious Normed Fit Index |
| RFI | Relative Fit Index |
| RMR | Root mean square residual |
| RMSEA | Root mean square error of approximation |
| S.E. | Standard Error |
| SPSS | Statistical Package for the Social Sciences Program |
| SRMR | Standardised root mean square residual |
| *p* | Probability |
| $x^2$ | Chi-square |

# CHAPTER ONE
# INTRODUCTION

## 1.1 Introduction

This thesis develops and tests a behaviour model to predict the challenges that employee's user behaviour may pose to Thailand's electronic government (e-government) implementation. E-government is the integration of information and communications technology into governmental operational, managerial and service processes (Al-Hujran et al. 2011). Previous studies in developing countries like Thailand suggest a high degree of probability of failure for e-government there (Heeks 2003; Helbig et al. 2005). Although some general reasons have been identified (Dada 2006), it has also been noted that nation and culture specific factors also play an important role in these failures (Helbig et al. 2005; Dada 2006; Jaeger and Matteson 2009; UN 2012; Keretho 2013). Given that Thai culture has been described as unique in many respects (Nuangjamnong et al. 2010) it can be hypothesised that such idiosyncratic factors may be particularly important there. An investigation of one of the first large scale e-government initiatives in Thailand, the adoption of the Government Fiscal Management Information System (GFMIS) by the Ministry of Agriculture and Cooperatives (MOAC) offers a unique opportunity to determine the relative importance of universal and unique factors there.

An investigation of the adoption of the GFMIS by the MOAC also offers the opportunity to test if one of the standard models could be refined or elaborated. The Unified Theory of Acceptance and Use of Technology (UTAUT), developed by Venkatesh et al. (2003), is now one of the most accepted models in this area. A modified version of this model, incorporating four more constructs derived from other models, the Extended UTAUT, may prove to be more effective in Thailand and possibly elsewhere.

## 1.2 Statement of Problem and Rationale for this Research

E-government offers immense benefits to a country and its people. Integration of data and services across all governmental departments and sectors is possible with e-government (Al-Khateeb 2007; Carter and Belanger 2004). Since e-government also allows communication and integration at a global level, its development is important for a government to be an active

participant in world affairs (Al-Hujran et al. 2011). A survey conducted by the United Nations (UN) (2012) found that e-government has the potential to serve as an engine of development, particularly when it comes to enhancing the provision of public services and advancing equitable people-centred development.

An initiative by the UN for meeting sustainable goals by 2030 includes the adoption and implementation of e-government as major component of the targeted sustainable goals (UN 2016). The most recent survey monitors how countries throughout the world are adopting and implementing e-government. Some are only in the implementation stage while others have progressed to the point where citizens are accessing e-government services through the internet (UN 2016). The UN reports that ICT works well globally; citizens are using the services and joining in decision-making discussions when given the opportunity (UN 2016).

According to Rajinish (2014) three major strategies are needed to reach successful outcomes when implementing e-government.

- To make sure the citizens who will benefit from the technology are allowed to take part in decision making;
- To ensure that decisions are based on how convenient the technology is for businesses and citizens ensure that the government operations related to the technology are transparent; and
- To trust that the proper government departments take responsibility for quick turnover for service and for offering accurate answers to citizens through the e-government porthole (Rajinish, 2014)

The fast development of user-friendly information and communications technology has sparked implementation of e-government around the world (Carter and Belanger 2004). Although most developed countries have been able to create highly organised and well-used e-government systems, smaller and poorer countries have many challenges to overcome (UN 2012). For example, the UN 2016 Survey reported that Europe is leading the implementation, with the Americas and Asia in second and third place (UN 2016). In Asia the countries with the highest development of e-government are specifically the Republic of Korea and Singapore; these two countries are noted as the leading high performers located in Asia (UN 2016). Despite the benefits that e-government can bring, in developing nations, the majority

of governmental agencies have reported failure to one degree or another (Heeks 2003; Helbig et al. 2005).

Thailand implemented initiatives in the late 1980s to develop the IT infrastructure of the nation to ensure that it would have the capacity and capabilities of serving both the government and the private sector. To overcome the failures and limited success that such initiatives received, the Thai government established the Ministry of Information and Communication Technology (MICT) in 2002 and tasked it with the responsibility of developing and supporting electronic processes within the government, commerce, industry, and education sectors (Bhattarakosol 2003). As stipulated by the Thai government, the ICT Master Plan (Fundamental Plan for ICT of Thailand, 2002-2006) together with the ICT 2010 Framework highlighted five major developmental goals in the areas of e-government, e-commerce, e-industry, e-education, and e-society. It was believed that these goals would provide the framework for organisations in Thailand to develop the necessary systems to ensure the smooth accomplishment of these goals (Rassameethes 2013). As part of these initiatives, the Government Fiscal Management Information System (GFMIS) was developed, first being used in 2007.

A position paper from 2014 from the Joint foreign chambers of commerce in Thailand (Thomas, 2014) discussed the five pillars of the Thai e-government reporting completion of all 5 by 2014. However, according to Thomas (2014), the e-government performance for Thailand based on 'the Smart government' performance assessment was disappointing. The performance indexes for Thailand are listed below.

- 2005 = 0.5031,
- 2008 = 0.5518,
- 2010 = 0.4653,
- 2012 = 0.5093, and
- 2014 = 0.4361

Unfortunately development has remained static. Nevertheless, the plan for Smart Thailand 2020 is an ongoing project, with goals including improving coordination between e-government and citizens, ensuring equal opportunity for access to ICT and e-government (Thomas 2014, p. 9).

The experience of other developing countries (Heeks 2003; Helbig et al. 2005) suggests that Thailand has rather poor chances at meeting these goals. Heeks (2003) found that within

developing nations, 35% of e-government projects reported total failure; 50% reported partial failures; leaving only 15% reporting the successful implementation of projects of this nature. Similarly a study undertaken by Helbig et al. (2005), reported that the failure of e-government initiatives was approximately 60 to 80% among developing countries.

There are many reasons behind the high rates of failure to successfully implement e-government in developing countries. These include limited skills, poor training, lack of available resources, lack of the necessary infrastructure, lack of awareness, lack of adoption, and other non-technical and country specific factors (Dada 2006). It has become apparent that the success of e-government is highly dependent on the willingness and ability of employees to adopt the system (Hesse and Jean-Paul 2004). Despite this, the way e-government-related technologies gain acceptance by employees is not a highly researched area; most research in this area concentrates on the technological challenges of integration of such systems (Hesse and Jean-Paul 2004).

Technology Acceptance Model (TAM) research is relatively focused on IT/IS adoption by employees in an organisational context (Phang et al. 2005; Diaz et al. 2015). Both governments and academic researchers recognize the problem of low-level adoption of e-government services among citizens; a common problem in both developed and developing countries. E-government adoption, unlike most of IT adoption by employees in private-sector organisations, is voluntary and occurs often in turbulent social-political environments. Therefore, the problem needs to be addressed comprehensively from technological, social, political, and cultural perspectives (Diaz et al. 2015).

Previous studies have often assumed adoption and implementation challenges and solutions can be applied universally (Keretho 2013). This approach ignores the diversity of individual cultures, and often leads to failure (Keretho 2013). It is now becoming understood that efforts must be made to tailor the initiative to the contextual setting of the specific country (Helbig et al. 2005). For example, it has been argued that a country's social and business culture must be taken into account during and after the installation of the e-government systems (Jaeger and Matteson 2009; UN 2012).

This study sought to evaluate the factors that influence the acceptance and adoption of the GFMIS by employees of Thailand's MOAC. Additionally, the study sought to understand how

the current body of literature illustrates the different aspects of e-government so as to compare the theoretical and practical applications of the same within a real world setting. Such insight would be critical in bridging the gap that exists within the extant literature regarding the adoption of e-government initiatives, with a particular focus on the improvement of the measure of successful e-government initiatives in the future.

### 1.3 Significance of the Study

Most studies have addressed e-government implementations in the developed world, focusing in particular on Europe and the USA (Ebrahim and Irani 2005; Bélanger and Carter 2008; Dwividi et al., 2017). The study of Bélanger and Carter (2008) analysed the impact of trust and risk perceptions on one's willingness to use e-government services. Ebrahim and Irani (2005) noted the variety organisational and technological requirements essential for the adoption of e-government in public sector organisations. While some studies have focused on Asian initiatives, very few specifically looked at e-government implementation in Thailand (ElKheshin et al., 2015). These Asian studies have consistently identified investment requirements, institutional reforms and the availability of suitable technology as major challenges in e-government adoption and consequently, as significant contributors to project failure (Bélanger and Carter 2008; Thomas 2014). Many research studies are focused on the acceptance of e-government by citizens, in contrast with this study, that is focused on the employees working with the Thai government department.

It is possible that Thailand's situation mirrors experiences elsewhere but research is needed to learn if this is the case or if Thailand is under the influence of unique factors. Nuangjamnong et al. (2010) determined that the Thai culture is unique in many respects, a fact that could negate external validity arguments. Given that the uptake of the GFMIS by the MOAC was one of the first large scale e-government initiatives in Thailand, an examination of it is an ideal opportunity to determine the extent of the idiosyncrasy of Thai culture with respect to governmental acceptance and use of e-government. The study will help the current body of knowledge concerning the adoption of technologies by taking on the following research objectives;

Objective 1: Investigate the factors that influence GFMIS adoption by a governmental department in Thailand, specifically the MOAC.

Objective 2: Assessing the extent to which the results of this study agree with previous studies performed in Thailand and other countries in the region.

Objective 3: Addressing the extent to which internal organisational factors (as opposed to external end-users considerations) play a factor in the success of such initiatives.

Objective 4: Addressing the effectiveness of extending UTAUT in modelling the adoption of e-government systems.

The findings will aid Thailand in understanding and implementing or adjusting policies and strategies concerning the adoption of ICT.

- This study may identify current problems with the adoption of the GFMIS by the MOAC, and potentially suggest solutions to them, such the creation of new training programs, the modification of current training programs, policy changes, reward systems, and suchlike (Pansak 2004).
- Because it deals with the uptake of e-government by the MOAC, any problems identified and solutions recommended by this study have the potential for increases in efficiency for Thailand's agriculture sector (Thomas 2014).
- Any problems identified and solutions recommended by this study may potentially be generalised to similar initiatives in Thailand, thereby improving the adoption of e-government more generally (eGov 2013).
- By focusing on adoption of an e-government initiative by staff rather than by citizens, it has the potential to reveal how much this rather poorly investigated aspect may affect e-government adoption, in Thailand, and possibly elsewhere (Pansak 2004).

### 1.4 Objective and Research Questions

The primary objective of this study is to investigate the factors that influence GFMIS adoption by a governmental department in Thailand, specifically the MOAC.

Based on the above study objective, this research study seeks to answer the following research questions:

1. What is the level of GFMIS adoption by a governmental department in Thailand, specifically the MOAC?
2. What are the factors that promote GFMIS adoption in a governmental department in Thailand, specifically the MOAC?
3. What are the barriers to GFMIS adoption by a governmental department in Thailand, specifically the MOAC?
4. What are the lessons that may be learned from this study that might be applied to other technology adoption initiatives (and where might they not have application) in other governmental departments in Thailand.

### 1.5 Methodology

This study employed a quantitative cross-sectional study design, obtaining numerical data from a sample that can reliably represent the entire population (McCusker and Gunaydin 2014). By surveying slightly more than two-thirds of the employees the MOAC that use the GFMIS, the study was both targeted and representative of the users of the system, while also being inexpensive and quickly performed. The quantitative data collected also helped maintain cost- and time-effectiveness of the study, while also allowing rigorous and well-accepted statistical analysis of the results. However, the results describe the situation within Thailand only at the time of the study and no follow-up was conducted following the completion of the initial data collection.

The questions asked of participants in the questionnaires were designed in a manner that would enable participants to share their opinions on and perceptions of the determinants that influence ICT adoption by Thailand's MOAC.

The research started with a thorough review of relevant literature on the topics of e-government adoption behaviours in various countries, resulting in the generation of the 12 hypotheses that are presented in Chapter 4. The positivist paradigm was adopted because the method has been shown to be useful in testing hypotheses (McCusker and Gunaydin 2014). At the completion of this study, the relationships that existed between different variables were quantified, and

statistics were applied to explain the identified relationships. Data consisted of the responses obtained from the structured questionnaire, with the methodologies employed herein serving to either verify or contradict the existing theoretical hypotheses.

The decision to collect quantitative data is appropriate because the study seeks to provide answers to study hypotheses, as opposed to attempting to originate a new theory (McCusker and Gunaydin 2014). The researcher distributed the questionnaire among the MOAC departments and collected the responses at a later date and time. 600 respondents from the MOAC departments were asked to provide their responses to the questions in the questionnaire using the Likert scale, which allows a participant to record their agreement or disagreement with a series of statements with a number between 1 and 7, with 1 indicating 'strongly disagree' and 7 indicating 'strongly agree' (McCusker and Gunaydin 2014). The data was collected from participants in twelve of the fourteen major offices of the ministry of agriculture, where there was a high likelihood that a significant number of respondents would be found.

The responses of the survey were organised into a databank. And then, the data collected from the questionnaire was analysed using the Analysis of Moment Structures (AMOS) program in order to find a model fit for each construct (Statistic Solutions 2016a). The one-factor congeneric models and confirmatory factor analysis (CFA) was carried with AMOS to better understand what statistical relationships exist between and among factors. CFA is useful for determining the degree of 'fit' of the conceptual model before applying the structural constraints of structural equation modelling (SEM) (Hsu 2010; Khine 2013; Statistic Solutions 2016c). Research methodology is described in greater depth in Chapter 4.

### 1.6 Outline of the Thesis

This thesis consists of six chapters.

Chapter 1 provides an introduction to the study, presents in the background of the problem, problem statement, research objective, research questions, the significance of the study, and a brief discussion of the methodology.

Chapter 2 contains the literature review. The drivers and the constraints to building e-government structures are reviewed, as are the experiences reported in current and relevant

literature concerning public partnerships and e-government. Specific examples of developing countries that have applied ICT are offered. Applications in Asia are discussed generally, followed by specific applications discussed within the literature in countries such as Vietnam, Jordan in the Middle East, and Egypt in Africa on the challenges faced in the adoption of ICT.

Chapter 3 contains a discussion of conceptual frameworks that have been developed to better understand the human behaviours that apply to this study.

Chapter 4 contains a description of the research methodology. The strategy for carrying out the research and design of the survey are discussed. Data collection methods, data preparation practices, and an introduction to the data analysis procedure are likewise described.

Chapter 5 contains the analysed data obtained from the results of the survey.

Chapter 6 offers a conclusion for the research with an explanation of the findings, limitations, recommendations and suggestion for future study.

# CHAPTER TWO
# LITERATURE REVIEW

The following chapter includes an overview of e-government and ICT. Attempts to adopt e-government by developing countries, and Thailand in particular, are discussed.

## 2.1 Overview

E-government is a combination of new technologies, combining computers, software applications, networks and the internet which are intended to build better and stronger relationships between a government, its departments and its citizens (Al-Hujran et al. 2011). Although e-government offers significant advantages, establishing e-government is a protracted process. After conceptual (Leelahaphan 2014) and system (Aquaro 2014) design, e-government systems must be implemented, establishing means by which staff can control and maintain, and the public can access, ideally through a number of platforms (Chen and Dimitrova 2006; Loo et al. 2009). Success or failure of e-government is ultimately measured by its adoption and use by the government and people (Chen and Dimitrova 2006); several indices have been devised to measure this (Gupta and Jana 2003).

In developing countries, e-government faces a number of challenges, notably the 'digital divide' (James 2007), which can lead to the failure of implementation or adoption of e-government (Nurdin et al. 2011). An examination of a number of developing nations' attempts to implement e-government suggests that success or failure can be the result of factors that are idiosyncratic to the country or culture in question (Helbig et al. 2005; Dada 2006; Jaeger and Matteson 2009; UN 2012; Keretho 2013). As a result attempts to use a uniform "one size fits all" approach to implement e-government faces a high probability of failure (Keretho 2013).

In Thailand, e-government initiatives have their roots in the mid 1980's (Nectec 2006), but it was not until 2009 that the matter began to be approached systematically with the "road map for the advancement of the e-government" (Nuangjamnong et al. 2010). This process is ongoing, being backed by several bills in 2017 (Somwaiya and Keerativitayanan 2017). Thailand's approach has yielded some results, with e-government indices that place them at the lower-to-middle rank of Asian nations (Al-Masri 2013). Factors that have been noted as

being important in the relatively poor implementation and adoption of e-government in Thailand are relatively poor infrastructure and a poor institutional environment (Thomas 2014).

The GFMIS is one aspect of Thailand's efforts to establish e-government. Developed in 2004 (Carter and Belanger 2004), the GFMIS is designed to maintain accounting records and standardise financial procedure across all levels of government (Carter and Belanger 2004), replacing the manual requests to the treasury that existed previously. The Thai government made it compulsory for the GFMIS to be adopted by all government departments (Chhabra 2013); this was achieved, although there were some problems with implementation, notably lack of co-ordination among agencies and inadequate training (Lorsuwannarat 2006), and adoption, with some staff becoming concerned by the increase in responsibilities and need for precision (Chhabra 2013).

## 2.2 E-Government

### 2.2.1 Benefits of E-Government

Governmental departments have been viewed in the past as mammoth, complex, bureaucratic establishments with many information silos that create barriers to information access and make service provision cumbersome and frustrating (Al-Khateeb 2007). This is in part due to the traditional approach they use, which is labour intensive, and the use of papers and files requires manual managing and is associated with various disadvantages concerning inefficiency, lack of quick access to knowledge management, collaboration, and accessibility (Mehrtens et al. 2001).

E-government systems are expected to increase operational efficiency and increase the capability to solve challenges that plague bureaucracies, by offering better communication between departments and sharing one database within the entire organisation (Ostasius and Petraviciute 2010). Global information sharing has grown faster due to the success of the Internet and new technological developments (Yeow et al. 2008). Therefore, the demand arising from economic, demographic, social, and global trends does not allow governments to choose whether or not to implement e-government; instead e-government appears to be a necessity for any country who wishes to enter into the 21st century as a competitive nation within the global arena.

E-government, when appropriately delivered, will allow employees provide a higher quality of work, improve communications while at the same time attaining greater efficiencies (Carter and Bélanger 2005). Employees will be able to coordinate business transactions, oversee tax and fee payments, and track budgets and payroll processes more efficiently (Bélanger et al. 2002; Hiller and Bélanger 2002 cited by Carter and Bélanger 2004; 2005). Furthermore, e-government is likely to result in a variety of considerable cost savings for government departments due to decreased time needed for employees to carry out tasks and fewer item purchases such as for paper and printing use (Chieochan and Lindley 2000).

### 2.2.2 E-government Background

Any e-government must be adaptable for future changes so government interactions can progress over time as needed by the government. The strategy of developing e-government is dedicated to setting the mission and goals (visionary plans), as well as keeping the project focused so that the practical objectives are met. The only way to meet the original benchmarks and goals and to keep the project on track is to develop performance measurements (Chieochan and Lindley 2000).

The history of the implementation of e-government from 2003 to 2016 is significant. The rankings of countries were illustrated as table 2.1.

Table 2.1EGDI E government development index

The total countries equal 193 so ranking is # out of 193.

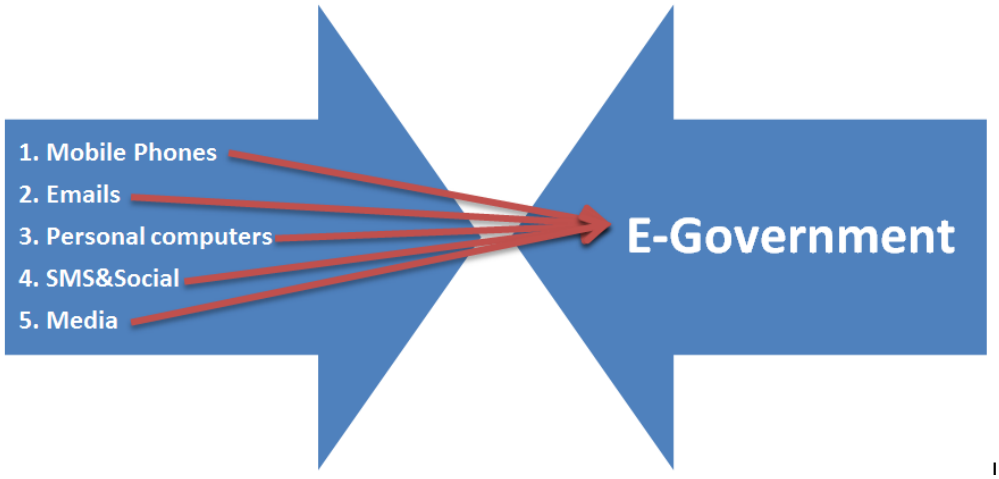
| | Thailand | | Vietnam | | Armenia | | Egypt | |
|---|---|---|---|---|---|---|---|---|
| | EGDI | EPI | EGDI | EPI | EGDI | EPI | EGDI | EPI |
| 2003 | 0.4456 (56) | 0.1034 (69) | 0.3573 (97) | 0.0172 (123) | 0.3767 (86) | 0.0517 (91) | 0.2384 (140) | 0.072 (123) |
| 2004 | 0.5096 (50) | 0.2131(41) | 0.3378 (112) | 0.0154 (123) | 0.3919 (83) | 0.0328 (97) | 0.2653 (136) | 0.0164 (123) |
| 2005 | 0.5518 (46) | 0.2540 (32) | 0.3640 (105) | 0.1270 (63) | 0.3625 (106) | 0.0635 (83) | 0.3793 (99) | 0.0794 (73) |
| 2008 | 0.5031 (64) | 0.2955 (41) | 0.4558 (91) | 0.5227 (16) | 0.4182 (103) | 0.0455 (135) | 0.4767 (79) | 0.2500 (49) |
| 2010 | 0.4653 (76) | 0.0.857 (110) | 0.4454 (90) | 0.0857 (110) | 0.4025 (110) | 0.0420 (135) | 0.4518 (86) | 0.2857 (42) |
| 2012 | 0.50936 (92) | 0.3158 (48) | 0.5217 (83) | 0.1053 (101) | 0.4997 (94) | 0.000 (161 | 0.4611 (107) | 0.6842 (15) |
| 2014 | 0.4631 (193) | 0.5490 (54) | 0.4705 (99) | 0.4902 (65) | 0.5897 (61) | 0.5294 (59) | 0.5129 (80) | 0.5490 (54) |
| 2016 | 0.552 (77) | 0.5932 (67) | 6949 (43) | 0.6949 (43) | 0.5179 (87) | 0.5254 (84) | 0.4594 (108) | 0.4068 (107) |

Source: Publicadministration 2017

The UN suggests that several questions need to be answered when developing the performance metrics; the UN recommends a framework to structure an effective e-government with four stages (Gupta and Debashish 2003). The four stages begin with the "presence" phase, followed by "interaction" which leads to the "transaction" phase and finally to the "transformation" phase (Gupta and Debashish 2003: 370).

The United Nation's Department of Economic and Social Affairs (UNDESA) is tasked with enhancing the capability of nations to implement global policies. E-government is a policy framework that was developed in conferences and meetings of UN members, international, and global agencies (Yenyuen and Yeow 2009). The UN carries out a global survey to measure the progress towards reaching e-government goals in each participating nation. The potential benefits of e-government have also brought about an increase in the number of e-government initiatives across many developed and developing countries (UN 2012). However, it is crucial for governments worldwide to place great emphasis on the integration between distributed government structures so that practical interactions are created in order to lead to broad, sustainable development (UN 2012).

Figure 2.1 Multichannel Thai e-government communication devices

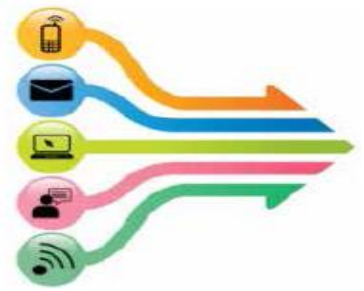



Source: UNDESA 2014

The strategy for making e-government inclusive is to implement service delivery through multiple channels or pathways. ICT technology allows many communication channels, including the use of mobile telephones, e-mail, personal computers, laptops, text messaging (SMS), and Bluetooth (see Figure 2.1). For the initiative to be truly inclusive, the service delivery design must apply to a multichannel communication system.

In other words, the goal is multichannel e-government delivery from each department. The traditional face-to-face encounters and telephone methods for communication are still at the foundation of human interactions; but digital channels are essential in building healthy relationships between government agents that lead to efficient communications (Chieochan and Lindley 2000) (see Figure 2.2). The channels are then used to execute government agency tasks and conventional voice services through advanced communication channels and technologies. A helpful way to understand channels is to think of each channel as a "touch-point" (Aquaro 2014).

Figure 2.2 International Symbols for Multichannel E-government,



International symbols defined, top to bottom: Mobile phone, E-mail, internet-connected computer, instant messaging, Wi-Fi. These symbols are now used by Thailand as part of adoption of e-government.
Source: Public administration 2017

Technologies that are necessary for success in offering multichannel delivery include the ability to accommodate the growing use of mobile devices like mobile phones, tablets, and computer notebooks. The foundation of e-government is the technological infrastructure framework. Once the infrastructure is ready for use, good ICT access becomes the goal. ICT literacy of the managers, developers, IT personnel and the citizen users are often barriers in developing countries. Furthermore, the identity management and privacy protection are sensitive issues with certain legal implications. The data used in e-government delivery can be divided into broad categories that include user profiling, e-service usage data, and service knowledge databases, and all of which need to be secure from hackers or other intrusions (Aquaro 2014).

### 2.2.3 Conceptual Design

The diffusion of technological innovation takes time to flow through the different communities and channels of society. Innovation has a significant influence on decision-making. A theory called Actor-Network Theory (ANT) takes into account both technical and social characteristics, in this case the ICT and the human factors. Instead of diffusion, the concept of translation is used (Leelahaphan 2014) Actors translate other individuals' interests and share interests with them. During the transfer of knowledge, a network of various and diverse non-human and human artefacts develops in complexity. ANT enhances the "innovation of ICT interventions in developing countries" (Ashraf et al. 2007). Information systems are designed by taking into account human factors and societal contexts because of their impact on organisations. The movement of knowledge and innovation includes the element of change as a socio-technical dynamic (Ashraf et al. 2007).

ICT is complex and is considered in smaller components for a better understanding. Development is the central concept, and the position of ICT looks at how development and ICT interact (Ashraf et al. 2007). The idea of development is measured through several means. Development and growth were concepts that were considered as interchangeable until 1960 (Ashraf et al. 2007). The problem with interchanging the two measurements is that growth provides information on per capita national income, whereas development is made up of diverse, complex features. Some of the features that inform the development of countries include culture, technical capabilities, social structure, politics, and the economy. A popular breakdown is into the two categories: (a) Non-economic or social measure, and (b) Economic measures.

The economy directly impacts a nation's development; but many other aspects need to be taken into account (Leelahaphan 2014). An important economic thinker for the contemporary interpretation of development is Nobel Prize winner Sen's presentation of a 'capability approach.' Sen's concepts from his book Development as Freedom greatly influenced the United Nations Development Programme (Ashraf et al. 2007). As such, development is now measured by the Gender Development, Human Development, and Human Poverty Index and the Gender Equity Measurement. The Human Development Index is calculated from information such as the level of education and life expectancies of the population.

The Information Chain Model is an instrument that is helpful in understanding how diffusion of information and technology take place (Ashraf et al. 2007). The steps in the Information Chain include the capability to gain information and data from the correct sources; learn the relevance of the data, so it will be placed in context in order to be meaningful; the ability to carry out decision-making by application of the relevant data; and, lastly, the actions taken based on the decisions made. The types of resources needed for a person to be able to process information are relevant data, economic resources like money, skills and technology, social assets for gaining motivation, confidence, and knowledge, and finally, "action resources" such as "skills and empowerment" (Ashraf et al. 2007). The information chain model is a good reflection on the importance of information in an e-government system. The steps of the model and the types of resources needed are like a checklist for the implementation of e-government from a citizen's point of view, but a component that also needs to be included is how contexts differ in different communities. In a community where citizens have no access to data or information using IT, the steps of the model are meaningless, because there is no possibility of assessing data and applying it to decision-making (Ashraf et al. 2007).

The focus many adoption and implementation plans take is a narrow one, focus solely on the needs to fulfil the promise of e-government. Many times the mistake is made of carefully choosing the hardware, the software applications, content, and the placement of information kiosks and telecentres, completely ignoring the missing, and most essential, component. The missing link in the chain is the human factor because people need to have the skills to use ICT. People need the knowledge to understand how to use information practically if it is accessed.

An interesting twist is whether "need" or "want" is the correct factor to analyse when designing or assembling an ICT-development project (Ashraf et al. 2007). The importance is because taking the time to learn exactly what the users' are demanding must be done to enhance the changes of a successful project. A top-down approach investigates needs, but the discussion above indicates that a successful program moves from the top-down and the grassroots-up. Wants are examined by an investigation of "bottom-up, short-term analysis that ultimately determines what users demand" (Ashraf et al. 2007). The demand analysis by Heeks (2003) that evaluates the wants of potential users aligns wells with Sen's Capability theories (Ashraf et al. 2007). Sen's economic capability theory is a predictive model to identify the object or item of information a user is willing to buy and their capacity to purchase the thing they want. An example of Sen presented by Ashraf et al. (2007) and Heeks (2003) outlooks is that teaching

computer skills to poor people in developing countries is beneficial if the skills can be practically used in real world contexts. The bottom line is that the computer skills might not be as important as increasing "literacy, social power and socio-cultural influence" (Ashraf et al. 2007).

A related issue is that making ICT accessible is remembering that the ICT system is not filling a purpose unless the system is being used. The TAM model was designed to include the factors influential to a person's intention to use e-government's ICT system (Davis 1989). PU and perceived ease of use are the attributes that measure individuals' perception of the value of using the system. The perceived value stems from the transactions, needing public services, and gathering information that can be carried out by accessing e-government presence, (b) interaction, (c) transaction and (d) transformation (Gupta and Jana 2003). The implementation of information systems needs to be set up and needs to be running (Leelahaphan 2014). Performance measurements cannot be ignored. The mistake often made is that the government tries to measure too many features or the goals that are set in place cannot be measured. The human factor is an important feature of performance.

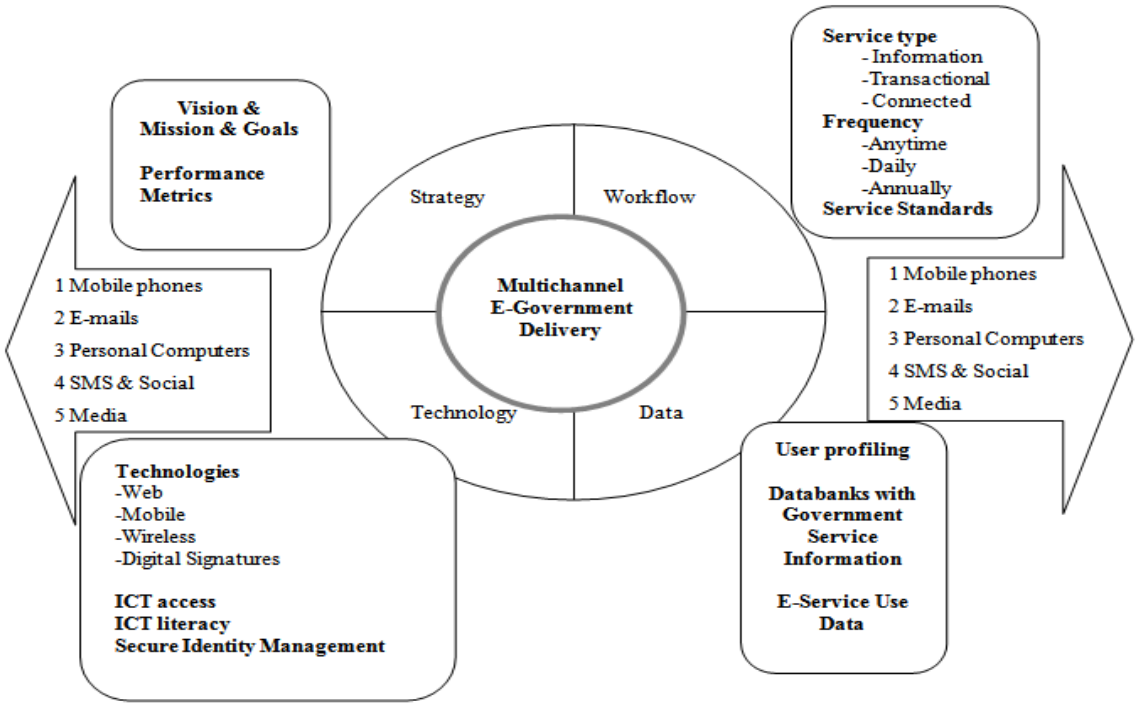
### 2.2.4 High-Level System Design

The four major design components of a multichannel delivery system are strategy, workflow, technology and data (see Figure 2.3) (Aquaro 2014). E-government 'channel integration' refers to the capability of joining online services into a single consolidated arrangement. Linking the services requires the physical or logistical arrangement of particular channels so that the services are easily available for users to access. The channel integration is expected to be carried out within a budget that keeps spending efficient but effective (Aquaro 2014). E-government 'channel optimisation' is similar to channel integration but specifically refers to the various ways used to ensure that the channels work as well as possible (Aquaro 2014).

The centre of focus (the nexus) of a multichannel strategy is to apply technology, data, and workflow to meeting the goal of establishing social equity; departmental employees are responsible for the daily tasks called for on the e-government system. Aquaro (2014) emphasises focusing on access to available technology, service applications, and value

propositions. The end objective is to maintain system satisfaction and best results by continuously applying evolving and innovating solutions to meet challenges (Aquaro 2014).

Figure 2.3 Major design components of multichannel e-government delivery




Source: UNDESA 2014

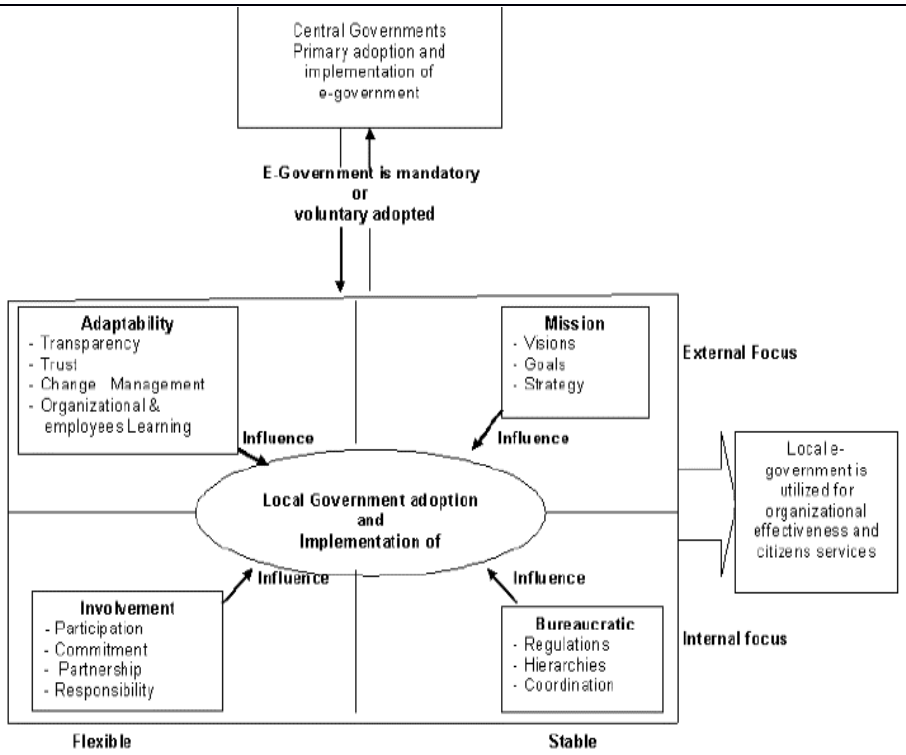
The foundation of e-government is the technological infrastructure framework. Once the infrastructure is ready for use, good ICT access becomes the goal. ICT literacy of managers, developers, and IT personnel as well as citizens can act as barriers in developing countries (Chieochan and Lindley 2000). Data used in e-government delivery may be divided into several major categories that include user profiling, e-service usage data and service knowledge databases or repositories, all of which must be secured from hackers or other intrusions (Aquaro 2014).

Workflow needs to be maintained at a consistent level, and high-quality outputs must also be consistent. The types of service workflows include sharing information, data and transactions such as receiving tax and fee payments (Chieochan and Lindley 2000; Leelahaphan 2014). The frequency of' access needs can be modelled to attain predictions, so that the system can be designed to meet the real life frequency of use. The frequency can be scheduled to meet high periods of use whether the access attempts are impromptu, daily, weekly or only annually

(Chieochan and Lindley 2000). The workflow also must include carrying out service standards measurements to learn how the e-government delivery is working (Aquaro 2014; Leelahaphan 2014).

E-government implementation frameworks are developed based on organisational dimensions and whether they are flexible or stable (Nurdin et al. 2011). The theoretical framework will still need adjustment based on the country where it is applied, however. (see Table 2.2) A limitation of the framework is the inclusion of factors that may not reflect cultural issues that need to be taken into account. The framework takes into account the influence of both internal and external features influencing implementation at the local level. The framework is useful in respecting the importance of the four organisational dimensions by using them as a platform for an increased understanding of the challenges. The conflicts between local and central levels of a country's government are also placed in the framework in a practical way so the relationships of the other factors can be placed in context.

Figure 2.4 Implementation Framework




Source: Nurdin et al. 2011

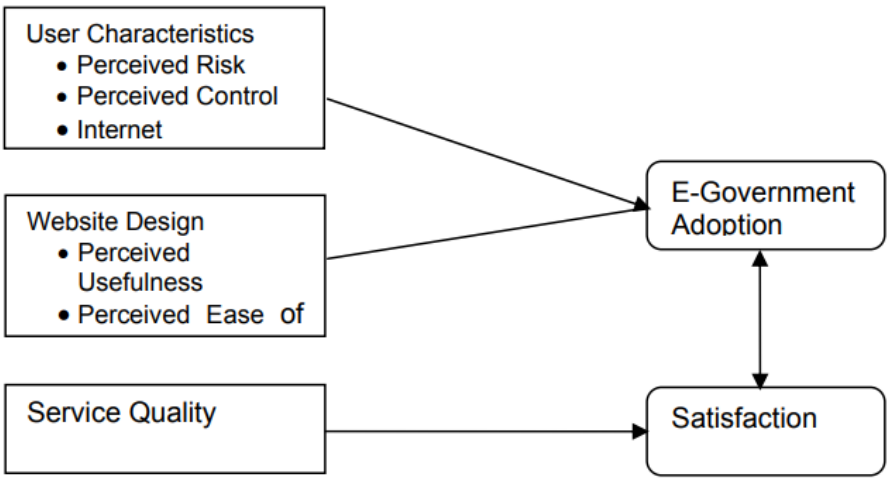
### 2.2.5 E-Government Implementation

Thousands and thousands of steps and hours are necessary to establish e-government systems. To understand the complexity of developing and creating a complete e-government system, one option is to consider the process as transpiring in four major stages. The first stage is to implement the basic website and public kiosks where communication technologies are available for citizens. The second stage is to enhance the e-government experience with synchronised channels to government web portals. Web portals need to contain informative text and web links to relevant web pages. SMS mobile portals should be ready for use at this stage, and additional public kiosks should be established (Chen and Dimitrova 2006). In the third stage, the channels should be coordinated so that the interactions between the channels run smoothly and so the channels reach web portals. Government SMS numbers should be published, and government mobile portals, mobile applications, and more public kiosks should be implemented (Chen and Dimitrova 2006). The link between citizens and e-government should then reach the stage where interactions with ICT are both easily and reliably carried out. Contracts for permits, trade, commerce, and other non-financial and financial business activities should be made within the secure environment the e-government system. Transactions between Public-Private Partnerships must then be established and online by the third stage (Loo et al. 2009). Finally, at the end of the fourth stage, all the channels will be integrated into the total e-government format.

### 2.2.6 E-government Adoption

The initial models on the adoption of e-government have failed to provide a precise definition of adoption. Chen and Dimitrova (2006) defined adoption as the intention citizens have to engage themselves in e-government and in receiving information and requesting for services from the government. Chieochan Lindley (2000) defined it more simply as the willingness to use e-government services. Both the willingness and the intent to utilise e-government may be viewed as one-dimensional measures in the adoption of the same. Chen and Dimitrova (2006) explain that the adoption of e-government is a multi-dimensional construct based on complex relationships. At the outset, adoption can be defined as the decision to use or refuse to use services that are provided online (Chen and Dimitrova 2006). Intention to use the system is a potential behavioural factor that influences the government employee to voluntarily use the system as a matter of course.

Figure 2.5 Conceptual Model of E-government Adoption




Source: Kumar et al. 2017

Measuring adoption would address the frequency at which the provided services are being utilised. A single usage annually, which may be considered to be a certain form of adoption, is one that does not translate to any meaningful usage by the government or citizens (Chieochan and Lindley. 2000). As such, the scope of usage, looking at whether the governmental website is used for obtaining information, interacting with the government or its agents, or completing transactions through the website, serves as another dimension of adoption (Lee et al. 2009). The other possible aspects of adoption include a preference for the governmental website as compared to other available websites, and a preference for the medium of online delivery over other transaction mediums that are available with the government (Chen and Dimitrova 2006). For example, when looking for information regarding services provided by the government, do citizens usually begin their search online for information on the governmental website or is it considered to be the last in priority (Khan and Pessoa 2010)? All the dimensions concerning whether or not citizens would prefer to use the governmental website when interacting with the government or whether they would prefer the use of telephone or even paying a physical visit make up the factors that must be taken into consideration when exploring the adoption of e-government.

Looking at online tax services, a major use of online governmental services in some countries, the literature has proposed some ways in which citizens' trust of e-government services can be enhanced (Sharma 2007). Trust that is institution-based, such as that placed in a fair and independent judiciary system, is considered a necessary factor in developing trust in e-

government programs (which citizens' trust of e-government). For the users of e-government services, a lifelong social disposition toward a belief in government systems and trust in others, together with the same group expectation that of all the parties involved can be trusted is necessary to ensure the success of the program. The nature of experience that one had previously witnessed with e-government practices can also be a great source of trust on perceived benefits to experienced users (Sharma 2007).

The other possible variables that influence the adoption of ICT are the perceived benefits, cost, and perceived control of behaviours, the assumed usefulness of the service, and the presumed ease of usage (Khan and Pessoa 2010). The cultural variables like the distance to power and avoidance of uncertainty make up other possible variables in the literature. The assumed usefulness of a product or service can be defined simply concerning the utility of the system to the user and the perceived ease of usage, which is defined as how the user views how easily a given system may be used, particularly by individuals who are not highly skilled with computers. Ease of usage may be enhanced or less likely depending upon the impact of power distance in a culture (Hofsted 1980).

Power distance is a complicated factor, one that measures where an individual, organisation, or entity sits on the authoritarian, democratic employee involvement scale. Citizens who are found in countries of higher power distance, where there exists a greater distance between the lower and upper castes of society, are more likely to undertake the tasks that are specified to them by the higher ranks of the society (Sharma 2007). It is proposed that citizens in countries with greater power distances have a higher probability of adopting e-government than when compared to those in countries with smaller power distances (Khan and Pessoa 2010).

The variable surrounding the avoidance of uncertainty can be defined as the tendency to be averse to risk. Scholars argue that individuals found in cultures that experience higher uncertainty avoidance are likely to be more dependent on trust for the adoption of e-government initiatives (Sharma 2007). Related to this is perceived risk, defined as the fear of losing one's personal information and the fear of being monitored through the internet. The assumed risks of a new initiative typically have negative associations with the adoption of that initiative. Authors argue that the perception that an individual has regarding the level of control as to how their personal information is used, and how that information is likely to be acquired are factors that may work to encourage adoption (Sharma 2007).

Factors influencing the adoption and use of ICT can be the cultural, economic, environmental, ethical, legal or social (Aquaro 2014; Khan and Chen 2011; Khan and Pessoa 2010; Khan 2008; UN 2012).

Users must accept the government system and view it with trust if they are expected to embrace the new technology. Other necessary components for user acceptance include the idea that users must feel that the system is an attribute of open government and that data privacy and security are assured (Alateyah et al. 2014). Implementation of e-government requires a complex customisation between the technology and the implementation context in developing countries (Alateyah et al. 2014). User acceptance of e-government is essential to the success of the implementation, but gaining user intent to use and adoption are challenging, especially in developing countries (Alateyah et al. 2014). A user of the system must have a good experience with the e-government system, and then decide to accept the system, followed by the decision to adopt the concept as a practical way to do business or meet personal needs so they will continue to use the e-government system (Alateyah et al. 2013). User acceptance is discussed in more detail in Chapter 4, which focuses on the development of the UTAUT model.

### 2.2.7 E-Government Assessment

A variety of activities can be measured and used for benchmarks. An alternative to a simple counting method is to use a scoring method. Certain features of e-government have been scored by using a Likert-type scale (Straub 2009). A Likert-type scale allows the user to indicate their opinion about the technology by a rating system from 1 (strongly disagree) to 4 (neither disagree nor agree) and then to 7 (strongly agree) (Likert 1932; Robinson 2014). The weight of each factor is prioritised using this ranking method (Gupta and Debashish 2003). This scoring method lends itself for scoring comparisons for the same criteria in different regions or nations and between research studies. A few of the criteria that have been included in earlier studies are *"ease of use, reliability, the data query and display, storage and retrieval, documentation, expandability, reporting, speed, support, and pricing"* (Gupta and Debashish 2003: 381). Measuring the tangible and intangible advantages as well as the benefits of an e-government project needs to occur at a mature stage of the development (Gupta and Debashish 2003). The system needs to be up and running for a specific duration following implementation,

as opposed to immediately following the implementation of the same, which may result in skewed data. Measuring the performance of the system is something that cannot be ignored. The mistake often made is that the government tries to measure too many features or the goals that have been set are ones that cannot be adequately measured. The human factor is an important aspect of performance.

Alternatively, a scoring method, instead of a counting method, can be used. The following features of e-government can be scored by using a Likert scale, allowing those who have been asked to provide their opinion on quality of service with the ability to answer on a scale from 1 to 5 and to rank their experience according to their satisfaction with the service. The weight of each factor can be established as to importance or priority (Gupta and Jana 2003). The scoring method lends itself for comparison of scoring for the same criteria in different regions or nations. A few of the criteria suggested by Gupta and Jana (2003 p.381) include *"false of use, reliability, data query and display, storage and retrieval, documentation, expandability, reporting, speed, support, and pricing"*.

Reported results are based on specific activities that may be monitored in the form of outputs, outcomes, and impacts. Outcomes are defined as the reaction to demand; if a demand was not made then, an outcome could not have results (Varavithya and Esichaikul 2003; Aquaro 2014; Leelahaphan 2014). Outcomes result from the implementation of a recommendation. The fundamental first step is based on the actions of the legislative branch of the government and needs to be acted upon during parliamentary sessions. A results-based development for design can be in the form of a balanced scorecard because measurements can be made in several ways. Aspects measured here include whether the implementation of the strategic plan was efficient, whether the public sector component is working, whether the given component is effective, and the type of quality of service that is delivered (Sidgwick et al. 2006).

## 2.3 E-Government in Developing Countries

Developed countries experience higher success rates concerning the implementation of e-government when compared to developing countries. The trend occurs as a result of the fact that developed nations have a higher availability of resources, including money, fibre optic cables, telephone line infrastructures, and higher rates of computer literacy. In developing countries, e-government projects experience high rates of failure, with as many as 35% failing completely. Of those remaining attempted projects, 50% achieve partial success, with only 15% successfully implemented (Stryszowski et al. 2013).

A host of different reasons contribute to the rates of failure for e-government implementation, including limited information technology (IT) skills and training, a lack of resources and infrastructure, lack of awareness, lack of adoption, and other non-technical and country-specific factors (Heeks 2003). The success of e-government projects is dependent on employees in government departments to effectively adopt and use technology in all aspects of their work to fully harness its potential (Stryszowski et al. 2013). For this to happen, employees need to be well managed, properly trained and equipped with the relevant skills necessary to use the technology. Inadequate training and an ill-equipped employee will lead to reduced IT adoption and low-usage levels, which are likely to result in unproductive collaboration and disintegrated processes. At the same time, it is also important for citizen willingness to adopt and other external factors and may generate significant impacts when fully adopted.

Local governments of developing countries are often slower to adopt e-government than those in developed countries, for a variety of reasons, ranging from local authorities who are not dedicated to integrating e-government in their agencies and offices to lack of interest at the central government level (Khan and Chen 2011). Good management from the top can offer the coordination and support necessary for local governments through actions ranging from simply having a web presence to implementing transactional activities (Nurdin et al. 2011). Opportunities for training and workshops for employee are an important way top management can prepare employees (Nurdin et al. 2011).

Poor planning can contribute to failure; several countries that have failed in the implementation of their e-government projects have done so as a result of imprecise goals and ineffective strategies (Nurdin et al. 2011). The result of these shortcomings is that the necessary tasks for

implementation are not communicated appropriately to employees and consultants, in the same way, leaving different impressions of the vision and strategies to focus upon. Lack of coordination and important partnership benefits were not met, the organisational structure was weak, and management of the new design was not appropriately carried out (Nurdin et al. 2011). Clashes between the objectives of two or more competing projects are destructive, resulting in failure (Nurdin et al. 2011).

A literature review in 2011 listed the major organisational barriers that had been identified as the focus of various academic research projects (Nurdin et al. 2011). These included and were centred on low levels of participation by citizens, political offices, and users involved in the internal workings of the government. Lack of dedication to the projects by government leaders and low commitment by employees causes projects to struggle. If a government official dedicated to supporting the implementation of a facet of e-government and was replaced by an official who did not care about the project, then the project was most likely to fail (Nurdin et al. 2011). A good example hails from Tamil Nadu India where a public leader demonstrated support and commitment to the project 'Sustainable Access in Rural India.' Implementation of the ICT component was started, but when the next leader took over the position, no support or commitment for the program caused many problems (Nurdin et al. 2011).

Cooperation between partners and responsible parties must be present for success. Good communication and collaboration are important between partners, local governments, employees, and departments (Khan and Chen 2011). When no party in power takes responsibility, someone within the government must step up to take responsibility for funnelling the necessary resources to the project. ICT management needs to take responsibility for the proper integration of networks and other technology installations (Khan and Chen 2011). Additionally, change management must be handled in an appropriate manner for the organisation's character and the personalities of the employees involved. E-government is a significant change with the old way of governments conducting business no longer advantageous to citizens or the country. If no one manages the employee problems arising from change, the project is unlikely to achieve success (Khan and Chen 2011).

Transparency is also necessary so that everyone involved understands what is happening, why it is happening, and how it is happening. Lack of transparency between decision-makers, government administrators, and management is a recipe for failure that has always been

experienced in the implementation of GFMIS (Khan and Chen 2011). Feelings of mistrust by employees who are tasked with adopting and implementing the ICT strategies towards the government and its institutions will interfere with success. Governments and agencies that are corrupt in developing countries are unlikely to be able to put successfully into place e-government. Trust is a valuable commodity (Khan and Chen 2011).

The skills and talents necessary to implement an ICT system are vital, yet in countries that have experienced implementation failure because employee do not understand what skills are necessary (Dada 2006; Thomas 2014). Many employees do not have the necessary education or understand the need to focus on good communication skills for success. Any government wishing to develop or expand e-government needs t3o learn from the successes and failures of other governments, so the same mistakes are not repeated. The required training and education for ICT and the newest information applications and technologies are necessary. The vision for the country's e-government and its mission must be carefully crafted to include exactly what the government wants to accomplish. Difficult to understand, unclear messages or silence on the mission simply set the project on a path to failure.

The vision and mission statements should be publicly reviewed and understood before the adoption of the e-government project. During implementation, the goals may shift, but the vision and mission should remain the same (Khan and Chen 2011). For example, ensuring that every citizen has access to what they need from the government by using e-government should remain the same, whether stage 3 or stage 4 of the implementation is taking place. Goals that conflict with other government projects or agencies, or goals that are not specific, are barriers to success (Kovacic 2005). The goals must align with central and local government goals, and the goals cannot compete with other agencies in the government. The strategy and its plans must also be laid out in a simple format, such as through a systematic plan that demonstrates how the goal will be reached. The methods devised to implement the project need to be in alignment (Nurdin et al. 2011).

Barriers to organisational dimensions, including involvement, adaptability, mission, and bureaucracy, all work to affect the implementation of e-government (see Table 2.3) (Nurdin et al. 2011). These barriers serve to create a framework that defines the manner in which these barriers potentially create adverse impacts to the implementation of those e-government initiatives. At the same time, these barriers are also a necessary part of the government and its

relationships, lending insight into the importance of considering how each of those organisational dimensions is affected by barriers and what can be done to counteract those concerns to ensure the smooth and successful implementation of the same. Nurdin et al. (2011) made an observation that *"a characteristic of a thing can be determined by the relation amount properties, either by interaction or by combination."* However, those barriers may be combined with the different aspects of each dimension to create functional, practical applications that work to reduce such barriers.

Involvement must be supported by the participation of all stakeholders, the commitment of leadership and cooperation and collaboration between created partnerships. Involvement also requires that employees be committed enough to the project to assume responsibility for their work and feel an invested interest in the success of the e-government project (James 2007). The relationship between the organisational dimension of adaptability and the barriers needs to be considered to build a strategy to overcome those barriers. Bureaucracy replaces the Denison and Mishra theoretical framework component of 'consistency' (Nurdin et al. 2011). Other than replacing consistency with bureaucracy Nurdin et al. (2011) emphasised the organisational dimensions of involvement, adaptability, and mission.

Table 2.2 Barriers and relationship with organisational dimensions

| Organisational Dimensions | Relationship Barriers for establishing e-government |
|---|---|
| Involvement | Lack of<br>Participation<br>Commitment<br>Established Partnerships<br>Collaboration<br>Employees taking responsibility |
| Adaptability | Lack of<br>Adequate change management strategies<br>Change management use<br>Transparency<br>Trust by Employees<br>Trust by inter-government<br>Organisational training<br>Employees opportunities for learning |
| Bureaucracy | Lack of<br>Structural organisation definition<br>Coordination between government entities and employees (or no coordination) |
| Mission | Lack of<br>Clear vision (or no vision<br>Mission Statement (or none)<br>Goals (or no stated goals)<br>Strategies (or no strategy)<br>Structural organisation definition |

Source: Nurdin et al. 2011

### 2.3.1 Digital Divide

One notable example of e-government failure is a result of what has been termed 'the digital divide'. The digital divide is defined as the "the differential extent to which rich countries and poor countries benefit from various forms of IT" (James 2007). The divide is a perspective that can act as a planning and development platform. The people with the highest incomes (information access) are guaranteed access, while poor people (information poor) have no access. The divide is evident between industrial and developing countries, north and south, as well as high and low GNP (Ashraf et al. 2007). A digital divide between citizens with Internet access and citizens with no Internet access is often pointed to as an influence of the failures of e-government (Helbig et al. 2005). The digital divide and e-government need to be evaluated as a whole to understand better the estimated 85% failure rates reported in the early 2000s (Helbig et al. 2005).

The digital divide exists between people who have access to computers and technology on the one hand and the people who do not have any access. The digital divide is evident in all

countries, but is often most pronounced in developing countries. The divide may be a simple dichotomy that is caused because the market is slow to make sure technology is offered in parts that may be hard to reach or to certain groups due to social reasons. The market is expected to solve the problem, so the assumption is that intervention by public entities is not necessary (Legris et al. 2003).

The multi-dimensional digital divide perspective considers many more factors than only access. The demographic features that may have an influence are race, ethnicity, income, and geography, all of which can cause inequalities between individuals and groups of people that occur in society. Three divides are identified in one study the (a) democratic divide, (b) social divide, and (c) global divide (Helbig et al. 2005). Two more instances of divides added to the original three are a skills divide and an economic opportunity divide. The three levels of the multi-dimensional model are the information rich versus the information poor, the urban versus the rural, and possession of technical skills versus no technical skills (Helbig et al. 2005). According to UN *"Transforming the digital divide into digital dividends for development for the people necessitates a direct and targeted focus on vulnerable groups by e-government. Such a focus repudiates one sided or piecemeal e-government policy-making. As also corroborated by the evidence on usage and user needs, it requires comprehensive and hybrid approaches with integrative, multi-stakeholder and multichannel implementation frameworks"* (2012, pp 97-98).

The digital divide also reflects other concerns of inequality in society including "language, education, literacy, community and social resources" (Ashraf et al. 2007). In developing countries, the particular attributes to address are the "capability to increase opportunities, make training and development in ICT available, and ensure the appropriate content on the e-government sites" (Ashraf et al. 2007). The types of societal parity that are being addressed have a natural connection to the implantation of ICT innovations. According to Ramon and Garcia (2013), it is necessary to consider the digital divide effect of general internet acceptance when examining the factors influencing adoption of a specific online service or e-government.

### 2.3.2 Examples of E-government in Developing Countries

Developing countries around the world are at different stages in implementing e-government. Although commonalities exist between some of them, their success or failure is often the result of idiosyncrasies of the countries in question and their approach to e-government.

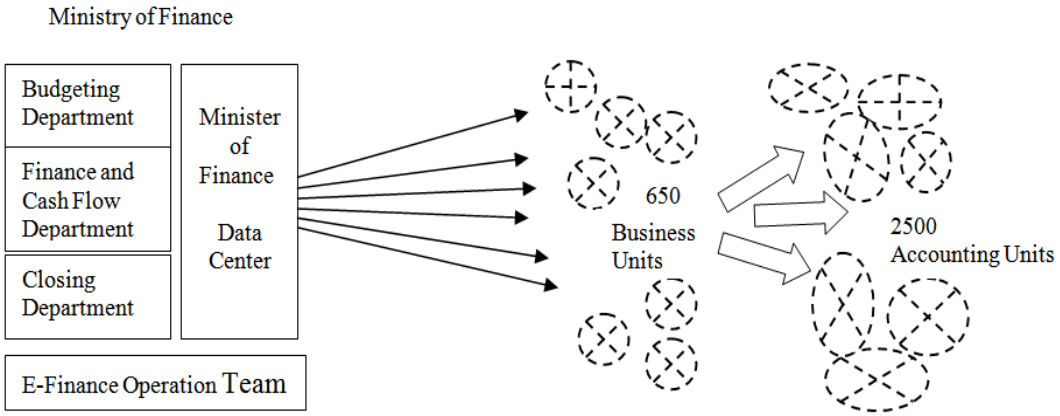
#### *2.3.2.1 Egypt*

Egypt devised a corporate scheme for e-finance that allows the government to compete for projects and contracts along with other banks and financial institutions (Al-Masri 2013). Egypt's adoption of e-finance provided many opportunities for collecting fees, taxes, and other online payment strategies. From July 2009 to the end of December 2014, EGP five billion was collected in taxes. The tax payment system is networked with about 33 banks that include 3,439 bank branches and 1,405 post offices (Al-Shuwekhi 2015). Another advantage of using e-finance is the improved integration of the unofficial economy 35% into the wider formal economy 65% (Al-Shuwekhi 2015).

Furthermore, Egypt's e-finance distributed about five million benefit cards to pensioners through the Electronic Payment Programmes for Pensions and Benefits (Daily News Egypt 2013a). An electronic petroleum subsidies program was also launched in 2013 (Al-Masri 2013), while in 2014, the national digital network (e-finance) introduced a smartphone application for iOS and Android, providing information to users on where to find petrol stations.

The Egyptian e-finance team includes more than 200 employees in charge of implementing, rolling out, and maintaining the operating system (see Figure 2.6). The Egyptian e-finance system is connected with all government entities, and the number of users nationwide is approximately 12,600.

Figure 2.6 Egypt's MOF Organisation for e-finance




Source: Darwish 2015

These successes do not mean that Egypt's e-government system is not without its problems, however. Challenges still facing Egypt's e-government total implementation include the fact that data is inconsistent, the security model is not reliable, there are certain difficulties associated with information sharing, and the fact that data cannot be shared readily between departments and the economies of scale are not developed. It is only a "scattered scenario" that is delaying a full and overall implementation in Egypt at this time; tax, health, justice and housing departments work independently without the capability to share data online (Evergreen et al. 2011).

The Egyptian government as a whole and the Ministry of Finance (MOF) in particular has learned important lessons from the implementation process (Al-Masri 2013). The overreaching lesson is that incremental steps should be taken due to the complicated process associated with applying the changes for transparency, accountability, and efficiency as well as meeting the needs of the public and business sectors, so careful planning before implementing each step is essential (Al-Masri 2013).

The best lesson Egyptian MOF experiences can provide that the process of implementation is best done incrementally. The implementation process used in Egypt can best be described as one of 'incremental improvement' to ensure a smooth introduction of new organisational procedures. The Egyptian MOF learned that incremental steps need to be applied to take central command for controlling and monitoring spending and receipts from the government ministries and departments (Al-Masri 2013). Other important implementation steps that must be taken

include the collection of data on operational and financial performances while at the same time enabling prevention strategies against fraud and potential hacking and other digital attacks (Al-Masri 2013).

Accessing important data on the government's cash position and economic performance must be designed incrementally so accessing the information is reliable. The Egyptian government also found it is important to recognise how costs of activities and tasks can be grouped together for easier management (Al-Masri 2013). To meet the difficult task of showing financial accountability to all the government's stakeholders, perhaps the most important being the public, and banks, other departments, suppliers, and other stakeholders, the finance ministry learned not to expect to be able to accomplish too much at one time (Daily News Egypt 2013b).

#### *2.3.2.2 Vietnam*

Vietnam began to use the Internet in the late 1990s, but by 2000, only 0.3% of the population was connected (Khanh et al. 2014). From 2000 to 2010 the level of Internet use increased 12.4 times, however, and by 2009, 17.9% of the population used the Internet (Khanh et al. 2014). The number of users at the end of 2013, as reported by the Vietnam Internet Network Information Centre, indicated that the country was ranked as "18/20 countries with the largest number of Internet users in the world. Ranking eighth (in) Asia, and third in Southeast Asia;" in December 2013, the number of Internet users in Vietnam amounted to 31,302,752, which was a 15% increase since 2001 (Khanh 2008).

Recent objectives in Vietnam for popularising ICT included the availability of electronic tax submission, but further efforts are needed to make available intuitive computer tasks for users to submit their tax returns more easily. One incentive Vietnamese policy-makers are working on is to "foster business-to-business (B2B) e-commerce to promote export industries," but the progress on the project is close to zero (Khanh 2008).The objectives presented at the Vietnam ICT Summit 2013 included business-to-business (B2B) and business-to-customer (B2C) for e-commerce and the promotion of e-government projects.

The challenges to implementation include little competition in the ICT sector, soaring piracy rates, and a lack of ICT skilled labour. Other identified shortcomings within the current

Vietnamese e-government system that must be improved include those within the areas of user interaction, communication with the "back-end system," implicit knowledge, code reusability, low workflow flexibility, and security issues (Khanh 2008).

#### *2.3.2.3 Armenia*

The Armenian experiences with e-government have concentrated on "The Concept of e-Society Development," which is how the overall program for implementation had been and is still presented by that nation. In 2009, an implementation unit was created, referred to as the e-Governance Infrastructure Implementation Operator in Armenia (EKENG). The chair position of the EKENG is the Ministry of Economy of the Republic of Armenia; the unit is responsible for the technical implementation of e-society in Armenia (Nurdin et al. 2011). EKENG is the company that is in charge of ensuring that the common e-government framework is coherent. It ensures that all the ICT systems are aligned with government business goals; interoperability is present; and that duplication is circumvented regarding investments. In 2011, the unit was tasked with continuing efficient implementation for both the Armenian government and the private sector.

EKENG issues digital signatures to legal organisations and individuals; no other company has the same right. The projects for e-identity scenarios include electronic identification (e-ID) cards (for internal identification) and biometric e-passports (for travelling outside Armenia). The Armenia police and EKENG coordinate the use of e-documents with biometric identifiers. Six multifunctional support systems maintain the e-ID cards (Al-Masri 2013). The accounts include e-Pension, e-Banking, "bank transactions, submission of applications for using bank services, receipt of information, account opening, checking, making transfers, receipt of statements, provision of complaints, suspension of cards, the closing of cards, etc." (Baghdasaryan 2011). The E-Signature Instrument is an e-card that contains personal and private keys and digital certificates so citizens will be able to use electronic signatures, authentication, and identification functions with a secure instrument. The Medical Card is proposed to contain a patient's necessary health information in case of an emergency. Armenia's driver's license data will be contained on a chip on the E-ID card. The e-payment card proposed will allow transactions, including paying utility bills versus using ATMs; e-

Commerce, cash advances, and card-to-card money transfers, payments for goods and services, and electronic payments over the Internet.

The financial management systems were not yet developed in 2006, but the plan for designing and implementing these e-government systems started in 2008 in the MOF. Exchange of messages between the Central Bank System and the e-government systems are carried out using the applications BankMail and Lotus. Information from the Central Bank is automatically recorded in electronic journals, and the necessary audit trail is included in the electronic database. Transaction data stored includes payment orders, payments received, and receipts. The supplier is responsible for providing the syntax of text between the supplier and the bank (Baghdasaryan 2011). The e-government system is implemented under the auspices of the MOF. The e-tendering and e-government interface within the system, because the import and export suppliers list, contracts, history of contracts, and trade agreements are needed immediately. The MOF is expected to implement this component of the system so that the interface works seamlessly (Baghdasaryan 2011).

The Armenian MOF was tasked with launching a human resource management (HRM) system as well, due to the integration of the payroll module. Payroll-related data and information will be held in the General Ledger database in the e-government system. Tax revenue and customs revenue systems must also interface with this system. The challenges that are anticipated are related to the differences in the existing tax system and the e-government system. Part of the problem is related to the large area that Armenia covers, an area that must all be organised under the same umbrella. A recommendation was made to script the revenue files to balance accounts periodically, either through the use of a weekly or daily. After the files are sent, they can be transferred to the e-government system using the Journal software application. The e-government system would be responsible for designing the database format.

## 2.4 E-Government in Thailand

### 2.4.1 Plan for E-Government in Thailand

In 1986, the Thai government established the National Electronics and Computer Technology Centre (Nectec) with a primary purpose of facilitating the process of knowledge transfer by undertaking, supporting, and promoting the development of electronics and computer technologies (Nectec 2006). Nectec was transformed in 1991 into a specialised national Centre under the National Science and Technology Development Agency to improve the performance and efficiency of Thailand's technology infrastructure. In 1999, the government and private sectors started to cooperate in developing e-government infrastructure under the auspices of Nectec.

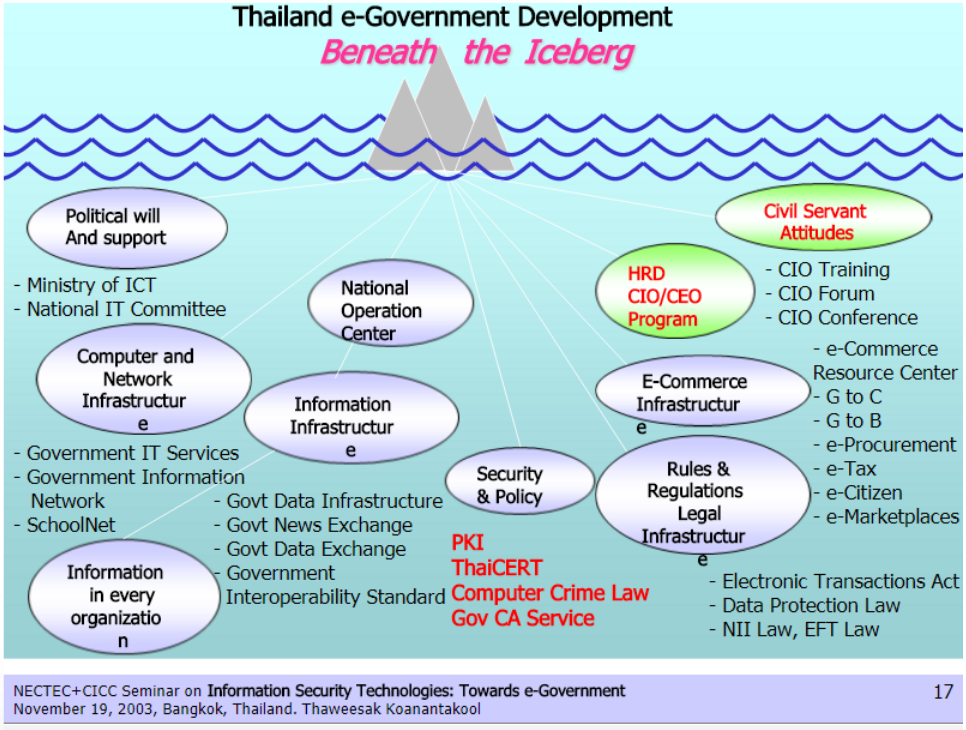
In August 2009, the 2009-2013 ICT for the human resource development master strategic plan was created. The plan lacked a clearly defined framework for establishing a national ICT skills and training framework (Nuangjamnong et al. 2010) (see Table 2.3). Although the concept of e-government in Thailand began in 2000, the lack of policies, practices, and frameworks for technology acceptance increased the challenges for Thailand's adoption and use (Nuangjamnong et al. 2010). The Royal Government of Thailand developed an instrument to initiate a digital economy referred to as the "Roadmap for the advancement of the e-government: 2009-2014" (Nuangjamnong et al. 2010).

In 2014, the Digital Economy Act was drafted, and the National Digital Economy Committee was established in Thailand (Leelahaphan 2014). The schedule for developing the IT system included the creation of a plan for launching a national satellite for Internet reliability. SMEs are the focus of the first pilot project for the establishment and support of digital literacy (Leelahaphan 2014). Thailand hoped to present an investment package for digital economy development in 2015, but by 2014 Prime Minister Pridiyathorn Devakula suspected that implementation would take more than a year, necessitating other governmental figures to continue the work that has begun.

Meanwhile the Thai government enacted the Digital Development for Economy and Society ACT B.E. 2560 (A.D. 2017) ("Digital Development Act"). The law was published on 24th January 2017 in the Royal Gazette. The Act became effective on and from 25th January 2017

(Somwaiya and Keerativitayanan 2017). The three topics addressed by the law are the Digital Economy and Society Committee Bill, the Digital Economy and Society Development Fund Bill, and the Promotion of Digital Economy and Society Bill (Somwaiya and Keerativitayanan 2017).

Figure 2.7 Thailand e-government development beneath the iceberg




Source: Koanantakool, 2017

Table 2.3Thailand's current outlook for digital economy

| | |
|---|---|
| By the end of 2014 or no later than March 2015 | Pridyathorn expects the final draft of the Act to be proposed to the National Legislative Assembly (NLA).<br>A feasibility study on the ICT Ministry's plan to launch a national satellite will be finished. |
| 2015 | The initialisation of the digital economy plan.<br>An investment package, if any, could be unveiled.<br>Supporting and creating digital literacy among SME's will be the first pilot project. |
| December 2015 | A national Digital Economy Committee, chaired by PM Gen Prayuth Chan-ocha, will be established. |
| 2016 | According to Pridyathorn, the whole project may not be able to be completed within a year.<br>Subsequent governments will continue the development.<br>The Digital Economy Act's first draft supporting the reform was written by the Council of State, the legal advisory agency to the government. |

Source: Leelahaphan 2014; Udomsirikul and Wattanavitheskul 2016

The integration of ICT in e-government services for knowledge management and knowledge retention will help in overcoming several critical issues. Therefore, it is crucial for the Thai government and policy makers to understand and identify relevant key influencing factors to establish effective strategies for adopting ICT in the Ministry Of Agriculture and Corporation (MOAC), one of the first government organisations to implement e-government in Thailand. (Al-Masri 2013). Somwaiya and Keerativitayanan (2017) stated that in order reach full potential for sustainable development in terms of the e-government, actions must be enacted to make ICT available and accessible to everyone and for government departments like the MOAC to respond well to the needs of the end-users and remain accountable for their performance. These various functions of e-government can help MOAC in different ways by boosting and recognising the agricultural scope and performance.

### 2.4.2 Conceptual Design

The Thai e-government model is based on taking a strategic development approach that can be considered both centralised and distributed (Varavithya and Esichaikul 2003). The distributed approach is applicable because the government promotes the adoption of ICT by each agency. The government does not intervene in the type of ICT used but keeps open the option to link with the computer system when the agency is finished. On the other hand, the centralised strategic approach refers to the government playing a central role in IT development within public agencies (Varavithya and Esichaikul 2003).

The beginning of the conceptual design for Thai ICT are found in the 1990s, but no national master plan or national ICT agency was set in place at that time (Varavithya and Esichaikul 2003). A national ICT industry would have existed if the Ministry of the Interior had established a population computer database at that time, or if the MOF had computerised the components of the tax system. Still, the objective of the government was to build an Electronic Data Interchange (EDI) to enhance the efficiency and effectiveness of the government within the government public sector, especially in the Customs Department in the Port Authority of Thailand (Varavithya and Esichaikul 2003). In 1996, however, the Thailand National Internet Technology Master Plan was created and entitled “Towards Social Equity and Prosperity: Thailand Internet Technology policy into the 21st Century” (Varavithya and Esichaikul 2003). In 2001, further action was taken and “The Thailand Vision toward a Knowledge-Based

Economy" was introduced as a plan to base the development of knowledge-based systems and efforts toward a more a sustainable economy.

### 2.4.3 ICT Adoption in Thailand

Thailand falls into the category of UN member within the middle e-government development index that ranges from 0.25 to 0.50 (Al-Masri 2013). The "equitability" component of the UN e-government development plan requires that the vulnerable and poor are given the same amount of access to e-government services as the rest of the citizens in the country (Gray and Sanzogni 2004). The Gross National Index (GNI) per capita in Thailand was reported as approximately 9,815 in the UN report published in 2014. The percentage of services available to the vulnerable populations of citizens equalled approximately 29%. That is to say, 29% of the most vulnerable members of the population have access. Although the GNI per capita is low in Thailand, government officials are committed to offering e-government services to all citizens (Gray and Sanzogni 2004). For example, Brunei also offers 29% of its services to the vulnerable, but the Brunei GNI per capita is almost 20% larger than the GNI per capita is in Thailand (see Table 2.4) (UNPAN 2014).

Table 2.4 Southeast Asia percent services available to the vulnerable and national income services

| Country | Percentage of Services | GNI per capita (2013) |
|---|---|---|
| Malaysia | 86% | 17143 |
| Singapore | 86% | 61803 |
| Indonesia | 36% | 4956 |
| Brunei | 29% | 53348 |
| Philippines | 29% | 4413 |
| **Thailand** | **29%** | **9815** |
| Vietnam | 29% | 3635 |
| Cambodia | 14% | 2494 |
| Lao | 14% | 2926 |
| Myanmar | 14% | 1300 |

Source: UNPAN 2014:129

The score signifies that the necessary documents such as applications for permits, information on regulations, and other requests by Thais are met online. The OSI is divided into four stages. Stage 1 is shown to be 94% completed, Stage 2 34% completed, Stage 3 is 14% completed,

and Stage 4 is 35% completed, leaving the overall percentage of finished e-government projects in Thailand at about 41%. (see Table 2.4)

Table 2.5 Online Service Index (OSI) and its components

| OSI | Thailand OSI | | | | |
|---|---|---|---|---|---|
| | **Stage 1** | **Stage 2** | **Stage 3** | **Stage 4** | **Total** |
| 0.4409 | 94% | 0.34% | 14% | 35% | 41% |

Source: UNPAN 2014

The Telecommunications Infrastructure Index is (TII) is established for all the UN member states. Thailand is ranked low in the TII ranking; the ranking is 0.2843. (see Table 2.6) The largest use of ICT is by mobile cellular phone users with 125.89 subscriptions per 100 inhabitants; these are the individuals the e-government employees may be targeting over the e-government system. About 26.5% of the citizens use the Internet and this is another group is likely to have a comfort level with the Internet.

Table 2.6 Thailand Telecommunications Infrastructure Index (TII)

| | |
|---|---|
| TII | 0.2843 |
| % Individuals using Internet | 26.50% |
| Fixed-telephone subscriptions per 100 inhabitants | 9.57 |
| Mobile-Cellular telephone subscriptions per100 inhabitants | 125.89 |
| Fixed (wired)-broadband subscriptions per 100 inhabitants | 6.52 |
| Wireless broadband subscriptions per 100 inhabitants | 0.15 |

Source: UNDESA 2014

The HCI is ranked in Table 2.8. The adult literacy rate was assigned an HCI of 0.6640 in 2005, which corresponds to an HCI value of 93.51% (see Table 2.7). The gross enrolment ratio index value was calculated to be 71.92% in 2009. The expected years of schooling approximated to 12.30% for 2009. The mean years of schooling index value in 2010 was reported as 7.6 mean years for citizens in Thailand. A challenge to the Thai government is to ensure that a well-educated population is developed to take over the responsibilities of the e-government system (Gray and Sanzogni 2004). Schooling must include training in soft skills (for students interested in management and policy issues) and hard skills (for students interested in information technology).

Table 2.7Human Capital Index (HCI) components for Thailand

| Year | 2005 | 2005 | 2009 | 2010 |
|---|---|---|---|---|
| HCI value (%) | 0.6640% | 93.51% | 71.92% | 6.60% |

Source: (UNDESA 2014)

The EPI ranking places for Thailand is in the middle at 0.5490 (see Table 2.8). The EPI is divided into three states. Thailand is rated 85.19% for citizen e-participation at stage one, 27.27% for stage two, and zero for stage three, as it cannot be calculated as of yet because it has not been implemented (Gray and Sanzogni 2004). The total completion of the three stages is calculated at be 50% as of 2004. The output from the analysis matches the OSI, which is shown to be approximately 41%, based on calculations of all total stages.

Table 2.8 Thailand Stages of E-Participation Index (EPI)

| Rank | EPI | Total % | Stage 1 % | Stage 2 % | Stage 3 % |
|---|---|---|---|---|---|
| 0.5490 | 0.5490 | 50.00% | 85.19% | 27.27% | 0.00% |

Source: UNDESA, 2014

Thailand's e-government Development Index (EGDI) level is in the middle and its income levels fall within the upper middle ranges. The other sub-regions that have a population falling in upper middle-income ranges are located in South America, and both sub-regions show an EGDI level of middle ranking. Overall, Thailand appears to have been reasonably successful integrating ICT and e-government to date.

The EDGI Is the E-government Development Index that shows Thailand's rank in 2016 was 25 points lower than in 2014. The 2016 rank is 77 out of 193 countries. As mentioned before, UK and Northern Ireland rate 1 out of 193. The 2016 OSI (online service index) for Thailand was rated at .5507, while the sub-region's top OSI ranking went to Singapore; 0.9710. UK and Northern Ireland were ranked first. The Human Capital index (HCI) for Thailand in 2016 was 0.6942 compared to Singapore's ranking at 0.8360 and Australia, the world's leader was first. The HCI sub-categories' rankings are literacy 98%, enrolment 76%, expected years of education (13%) and mean years of schooling (7%). TII is the Telecommunications infrastructure index and Thailand ranked highest for mobile phone subscriptions compared wth access to wireless, broadband, telephone lines and number of internet users. In terms of EPI (e-participation index) the ranking for 2016 increased to 67% from the 2014 rating of 54% (Gray and Sanzogni 2004).

Although Thailand's implementation of e-government is slower than planned, progress has been made in particular areas. E-passports and better passport renewals are implemented by the Department of Affairs but other ministries are involved in the process demonstrating an integrated government process (Thomas 2014). E-gates were instituted for Thai citizens at the Suvarnabhumi Airport. The electronic immigration method is out of the Immigration Bureau, although the process is not being adopted very quickly. Paying car taxed and drivers' license applications are the responsibility of the Department of Land Transport (Thomas 2014). Fifteen different internal revenue filing papers can be carried out online using e-revenue (Thomas 2014). E-customs, e-payment and e-tracking have been installed by the Customs Department. Smart ID cards were introduced in 2005 by the Ministry of the Interior; the process is progressing slowly because of limitations set by the Thailand E-Government Interoperability Framework. The Electronic Government Agency (EGA) was created with a mission to continue developing e-government services. (Thomas 2014)

### 2.4.4 Barriers to E-government in Thailand

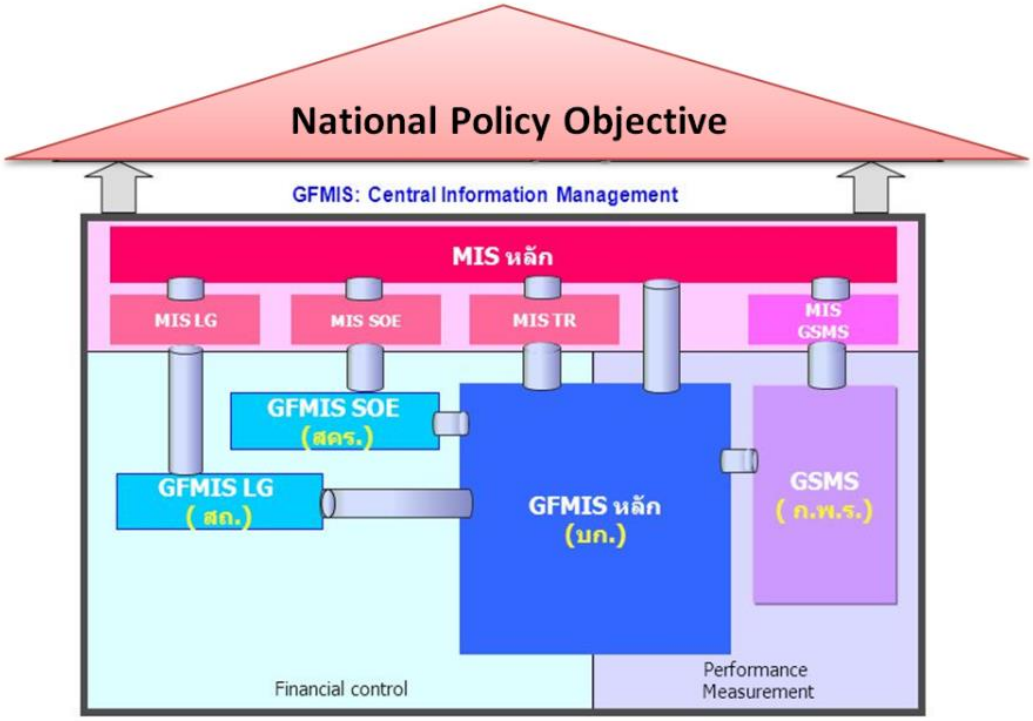
Thailand is considered in the category of upper-middle income country for overall the entire ICT performance, but the problems that cause barriers have been identified as poor institutional environment causing slowed adoption. The Thai government does not adopt strategies to "push the digital agenda nationwide" (Thomas 2014, p.9). The problems include poor economic enhancements "few organization models" and "low share of workforce in knowledge intensive activities" (Thomas 2014, p.9).

Thailand faces many challenges in the adoption of e-government; however, the main concern is interoperability (Thomas 2014). Interoperability is essential for ease of information sharing between government agencies, services, and organisations. The purpose of interoperability is to achieve integrated services development (Keretho 2013). Thailand needs good management, supervision, and oversight from a leadership position from high-level of government, and innovation must be embedded into the design of public e-government services through the utilisation of open source, crowd sourced, and community-sourced approaches (Keretho 2013). Regardless of these policies and goals, a major challenge faced by various governmental departments, including the MOAC, lies in the initiatives selected for the adoption and use of e-government (Rassameethes 2013).

## 2.5 GFMIS

The Thai government has been involved with some financial management reforms in the country thanks to the deployment of the GFMIS used for reporting and financial accountability (Carter and Belanger 2004). The GFMIS was developed by the Department of the Comptroller General (CGD), an agency supervised by the Ministry of Finance, in 2004. The basic purpose of GFMIS was to maintain accounting records and standardise financial procedure across all the agencies found in all levels of the government. The goal was to realise the centralisation of government departments' expenditures in real time for the purpose of making decision and planning intentions (Carter and Belanger 2004). Additionally, the government has developed departmental personnel information systems, initiated by the Office of Commission on Civil Services, for the purpose of standardising a broad range of government procedures including recruiting, reporting, salary, evaluation, promotion, and benefits (Carter and Belanger 2004). The national level system of the Thai government requires all the departments and ministries to adopt these new methods and practice them at the ministry's local and lowest level.

Figure 2.8 GMIS interconnections with agencies




Source: Modified from Terdsak (2017)

### 2.5.1 GFMIS System

The GFMIS consists of the initial computerised systems that are employed by the Thai government for control at the managerial level within the national level. Before the development of GFMIS, agencies were required to submit requests for payment to the Treasury and the CGD via manual channels (Chandra and Ghosh 2006). Assuming the CGD approved the request, it transferred the money to the department that requested it, and the department was then responsible for issuing a check and notifying the vendor that payment was available for claim (Chandra and Ghosh 2006). These practices were both time consuming and cumbersome and created difficulties in the reconciliation of some accounting and financial procedures that were non-standardised, including the bookkeeping entry methods and formats used. Additionally, it was not possible for CGD to track agency expenditures in a timely fashion.

With the introduction of GFMIS, new financial and accounting procedures have been established by the CGD that all government departments/ministries are now required to follow (Chandra and Ghosh 2006). The implementation of the GFMIS has standardised the financial procedures for the government as well as the formats used by the different branches of government and has since centralised governmental control of financial management among all agencies found within the country (Chandra and Ghosh 2006). It has also been reported that the new system has accelerated financial transactions, including the direct transfers and deposit made from the CGD to the vendors.

### 2.5.2 GFMIS Maintenance

The CGD is responsible for the maintenance of the GFMIS servers and terminal computers at the departmental and ministerial agencies. All the processes and transactions are conducted on the CGD's central servers (Chandra and Ghosh, 2006). Considering the information security concerns, any access to the system requires an account for the user in conjunction with passwords and or access cards. Due to the limited amount of network bandwidth and computers, it is possible for the CGD to provide each departmental and ministerial agency with two accounts and two computer terminals (Chandra and Ghosh 2006). The government made it compulsory for all departments to adopt the GFMIS. In addition to the capabilities of its system, the CGD also has budgetary and financial power over the other agencies (Chhabra

2013). Indeed, the CGD has mandated that all government agencies move from their original legacy systems to the GFMIS, willingly or unwillingly.

### 2.5.3 GFMIS Implementation

The implementation of the GFMIS has afforded changes in budget and expenditure procedures, increased transparency, and changes to governmental practices have made it possible for certain information to be instantly accessible by the CGD (Chhabra 2013). This gives the CGD the capability of monitoring the expenditures of individual agencies at all times and allows them to quickly identify errors in potential transactions. Despite the fact that literature indicates that monitoring through the system has been tightened, officials have never expressed concern over being watched through the GFMIS (Chhabra 2013). However, a number have expressed concern for the need to be thorough and careful in their individual work.

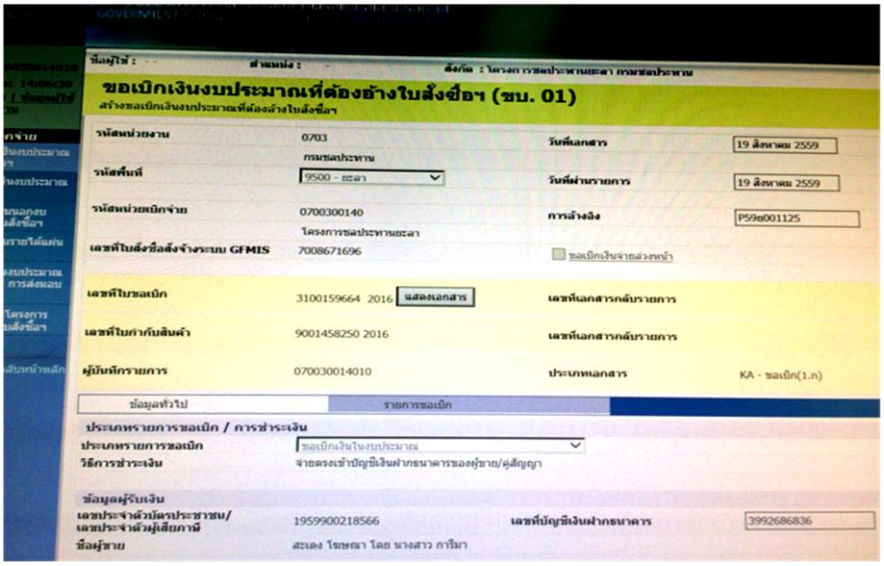
With the implementation of the GFMIS, the system does away with the repetitive process and paperwork that was necessary when using the manual system, since the financial section head becomes the approver of the request and is tasked with an individual review of the request for approval (Chhabra 2013). Middle managers, like the department head in charge of the financial section, do not necessarily welcome the kind of autonomy afforded by the GFMIS because it implies a higher number of responsibilities and additional, greater liabilities. Additionally, based on the fact that the GFMIS usually transfers money automatically to the vendors that have been listed in the requests, the work must be completed in an even more exacting manner, ensuring a high level of attention to detail from the official who has approval authority (Chhabra 2013). It is worth noting that the GFMIS system has made it possible for the government to evaluate the cost efficiency of a task performed by a given agency and all the activities undertaken at the departmental and ministerial levels through the conduction of cost comparisons on each agency toward the support of the results and goals of the government.

### 2.5.4 GFMIS and Government Agencies

The system requires agencies to define expenditures in an itemised fashion, based on the category of cost, development of infrastructure, maintenance, and upkeep. These categories assist the CGD in analysing agency expenses and afford comparison across the different agencies (Dada 2006). With this, the system serves as a repository of information and affords the central agency with the ability to use the information again in analysis, something that was very difficult to accomplish through the manual system. The GFMIS has enabled the institution of standardised government financial practices and procedures and created a central system of control for the government's budget and expenditures (Dada 2006). In spite of these benefits, officials at local agencies usually find that the adoption of this kind of system can give rise to some frustrations with the types of limits that the GFMIS put in place regarding the support offered to the internal operations of the agencies.

Due to the system security and license limitations, the CGD made it unlawful for individual agencies to create connections between their local system of finance and the GFMIS. The GFMIS is designed to be unconnected, closed to the financial systems of individual agencies, thus facilitating the objectives of CGD regarding the approval of budgets and account monitoring as well as the control afforded at the national level (Dada 2006). The design of the GFMIS does not take into consideration the accounting and financial practices at the ground level of the government, nor does it give support to the practices of individual agencies regarding accounting and financial audits. Additionally, the GFMIS only offers on-screen reports and does not allow for any printouts (Dada 2006). The agency must capture all reports on screen and then print those screen captures as proof of submission and definition of internal usage purpose (see Figure 2.9).

Figure 2. 9 Print-out of on-screen GFMIS for usage by a local office




Source: Royal Irrigation Department, MOAC Thailand Office (2016)

### 2.5.5 The Adoption of GFMIS

The implementation of the GFMIS as a component to e-government is carried out by all government agencies including the MOAC. The MOAC is responsible for the installation and implementation of the GFMIS among all its agencies found both at the regional and local levels. In Thailand, all the agencies or departments of the MOAC must be registered with the government, whether Thai farmers are the owners or not (Keretho 2013). Currently 38,972 agricultural cooperatives with a total of 14 governmental departments are working under the MOAC (Chieochan et al. 2003). The MOAC classifies cooperatives into six categories: general agriculture, water use, para-rubber producers, land reformers, dairy, and swine raisers. Each of these cooperatives plays a major role in Thailand's economy and social development. Due to the lack of centralised integration, these cooperatives do not engage in performance monitoring, knowledge management, or retention processes.

The interactions between farmers, agricultural entities and affiliated departments, and government authorities lack efficiencies due to inadequate infrastructure and support for systems coordination (Preedasak and NaRanong 1999). The GFMIS within MOAC clearly demonstrates the need to have these systems integrated in the manner of the Australian system of AGTIF or the Denmark Interoperability Framework (DIF) e-Government to attain effectiveness and efficiencies for its stakeholders (Preedasak and NaRanong 1999).

The initiative to integrate ICT into Thailand was proposed in 2006, the same year that Brazil published their e-PING standards. However, Thailand's ICT implementation did not have a good start (Tangkitvanich 2003). In fact, Thailand is in the 92nd position globally in the e-government development index. The Thai government and its various departments like MOAC and the Ministry of Information and Communication Technology (MICT) are implementing strong initiatives to develop and apply e-government to meet global standards and to enhance performance and knowledge management.

### 2.5.6 Barriers to the Acceptance of the GFMIS

Effective e-government at the local level is difficult to implement due to problems with organisational planning. Agencies tasked with building the e-government structure must have clearly defined goals, vision, and strategies (Nurdin et al. 2011). Mission statements for these initiatives provide meaning and direction for the project while consistently establishing the norms that facilitate their conformity (Nurdin et al. 2011).

Past research established that problems of GFMIS implementation at policy level included such issues as a lack of coordination among the agencies, lack of participation in policy formulation, insufficient attention to evaluation from the central agencies, and inadequate training (Lorsuwannarat 2006). There are also operational problems to include the impeding of budget transfer, wrong transfer, confusion in data input and there is difficulty in checking the fiscal status of government policies (Lorsuwannarat 2006). When viewing the UK and Canada, policies were set at the central government level making e-government application mandatory by a certain date or a penalty was imposed on the local level.

This mandatory approach has not been used in all countries. In Hong Kong and India in the completion of two e-government activities, the adoption of the government web portal in Hong Kong and electronic taxation overseen by Central Excise in India, were successfully implemented although the use of the services was voluntary at the local level, top-level management in the central government was supportive. Meanwhile, in Tanzania, mandatory adoption from the central government to the local level was expected for Integrated Tax Administration in all regions and control remains under the central government task force (Nurdin et al. 2011).

### 2.5.7 Scope of the GFMIS

The scope of the GFMIS covers a large area of multidisciplinary fields of knowledge. Developing a strong platform for the GFMIS is essential for the success of the program, though the success is not only based on the features of the GFMIS (Helbig et al. 2005). Many facets of the program need to be implemented well to achieve overall success (Khan and Pessoa 2010). Certain features should be brought to the attention of designers, especially anyone who might not understand that the complexity of the GFMIS rests on the foundation of the CD platform, or that other essential management issues will need to be well integrated into e-government. Management needs to organise carefully project management concerning the project plan, the budget, public financial management (PFM), change management, institutional change, and the requirements for the carrying out the program's tasks.

The benchmarks include offering relevant information and downloadable forms for taxes, utility payments (at city level) and fines. Customer service can be measured by the number of complaints or requests that have been entered and whether or not appropriate action has been taken in response to those requests (Leelahaphan 2014). Land use, property assessment history, permits applications, and whether budget reports are made available and are in downloadable forms are some of the other areas that can be measured and used as benchmarks (Gupta and Jana 2003).

## 2.6 Conclusion

It is clear that e-government offers benefits to all nations, developed and developing alike. However, getting e-government implemented and persuading both government employees and citizens to accept its use faces particular challenges in developing countries, many of which are idiosyncratic to the country in question, although some can be anticipated by looking at the experiences of similar developing countries. In the case of Thailand, one of the most notable examples of e-government is the GFMIS. This study will focus on factors that may affect government employees to accept using the GFMIS, the theoretical framework of which is described in the next chapter.

# CHAPTER THREE
# CONCEPTUAL FRAMEWORK

## 3.1 Model Conceptual Frameworks

This chapter discusses how the original derivation of Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003), and its subsequent extension in this study. The Original UTAUT was derived from a number of previous models, taking factors used in the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB), the Decomposed Theory of Planned Behaviour (DTPB) and the Technology Acceptance Model (TAM) (Venkatesh et al. 2003; Chen and Dimitrova 2006). Although the Original UTAUT is proven and well-accepted, there is the potential for creating a more refined model by taking potentially important constructs from models used previous studies and incorporating them into the UTAUT, to give rise to the Extended UTAUT. Four new constructs were taken from the Social Cognitive Theory (SCT) (Bandura 1986), the Motivational Model (MM) (Davis et al. 1992) and the Model of Perceived Consequences (PC)(Thompson et al. 1991) in this way to give rise to the model that will be tested in this study, the Extended UTAUT, in an attempt to determine what factors influence use of the Government Fiscal Management Information System (GFMIS) by Thailand's Ministry Of Agriculture and Corporation (MOAC).

## 3.2 The Evolution of the UTAUT Model

Considerable research has been dedicated to technology adoption and acceptance, particularly in the area of Information Systems. The original UTAUT model proposed by Venkatesh et al. (2003), the basis for developing the model used in this study, was derived from four previous models in this area of behavioural modelling (see Table 3.1).

The Theory of Reasoned Action (TRA) aimed to predict how an individual's behaviour might be affected by their attitudes and beliefs towards the practice in question (Fishbein and Ajzen 1975). TRA was expanded into the Theory of Planned Behaviour (TPB), by incorporating the impact of perceived behavioural control. TPB later gave rise to the Decomposed Theory of Planned Behaviour (DTPB). TRA was expanded again to give rise to the Technology Acceptance Model (TAM) (Davis 1989); proposing that acceptance of new information

systems technology was dependent on its perceived usefulness and its perceived ease of use (Lederer et al. 2000).

Comparisons of the effectiveness of these theoretical models in different IT-related industries and integration of behavioural science and planned behaviour led to the development of the UTAUT by Venkatesh et al. (2003). This model was designed to meet four objectives: user acceptance, perspectives affecting technology acceptance, dimensional impacts on an individual's technology acceptance, and empirical validation combining different points of view (Venkatesh et al. 2003).

Table 3.1 Acceptance Models that gave rise to the Original UTAUT

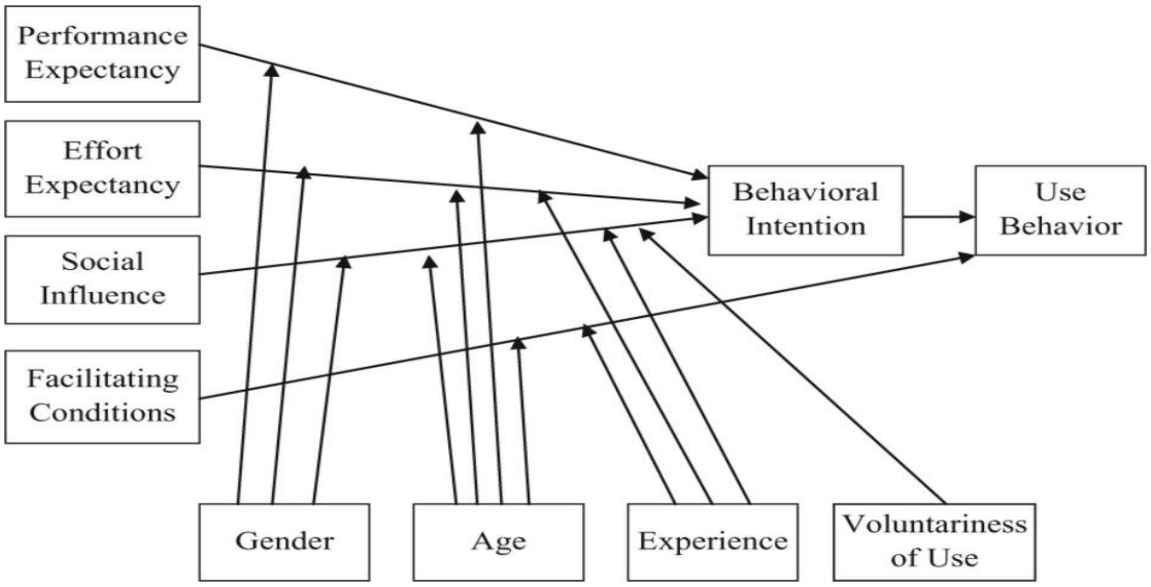
| **Models** | **Determinants of Behaviour** |
|---|---|
| Theory of Reasoned Action (TRA) | Attitudes towards the behaviour + Social Influences |
| Theory of Planned Behaviour (TPB) | Attitude towards behaviour and Perceived Behavioural Control (PBC) |
| Decomposed Theory of Planned Behaviour (DTPB) | Attitude towards behaviour (compatibility, complexity, and relative advantage) + Subject Norms + PBC (Efficiency and Facilitating Conditions) |
| Technology Acceptance Model (TAM) | Perceived Usefulness (PU) + Perceived Ease of Use (PEOU) |

Adapted from Chen and Dimitrova 2006.

The Original UTAUT model (see Figure 3.1 below) is distinguished from the models that preceded it by adding intrinsic and extrinsic motivational factors. It also separated Behavioural Intention, the intent to use a new technology, from actual Use Behaviour of the new technology. Behavioural Intention, itself affected by the factors of Performance Expectancy (belief that use of a system will improve performance), Effort Expectancy (ease associated with the use of the new system) and Social Influence (belief in peer group that a new system should be used), affects Use Behaviour, as does the Facilitating Conditions construct (organisational and social conditions in place to support a new system) to produce (Venkatesh et al. 2003). Gender, Age, Experience of the user and Voluntariness of Use mediate these effects (Venkatesh et al. 2003) This model has been widely used to enhance the understanding, adoption and usage of e-government (Alshehri et al. 2012a; Alshehri et al. 2012b; Alzahrani and Goodwin 2012).

As an example of the successful use of the UTAUT in modelling implementation of e-Government, The UTUAT was used to evaluate citizen adoption of Traffic Violation E-payment System (TVEPS) in Kuwait. Intention to use and the individual's Internet experience was found to be influenced by both social influence and effort expectancy (Khalil and Al-Nasrallah, 2014). Gender (male), trust, use intention and awareness were found to be significant predictors of actual use (Khalil and Al-Nasrallah, 2014). On the other hand, social influence, effort expectancy and internet experience were significant predictors of intention to use the TVEPS (Khalil and Al-Nasrallah, 2014).

Figure 3.1 The Original UTAUT Model




Source: Venkatesh et al. 2003

### 3.2.1 Advantages of UTAUT

The UTAUT model has been praised for its capability to inform the understanding of factors that determine the acceptance of an impending new technology. Most importantly, the UTAUT model explains over 70% of the technology acceptance behaviours, unlike other forms of the model that explain as little as 40% of technology acceptance behaviours for other models (Grant 2011). Moreover, its stability, validity, and viability in the adoption of technology surveys within several contexts have already been ascertained and practically confirmed (Alotaibi and Wald 2012). With these facts in mind, it is unsurprising that the UTAUT's

acceptance and popularity are much greater than the older models that preceded it (Al-Hakim 2007).

### 3.2.2 Shortcomings of UTAUT

Even though this model has attained an adequate reception from most researchers, some shortcomings exist (Waehama et al., 2014; Sekheshin 2016). One problem, common to many models, is that the UTAUT uses several terminologies that are similar in nature and quite difficult to distinguish in practice. A notable example is Behavioural Intention and Use Behaviour. Nevertheless, the benefits obtained from this model are far more significant than the shortcomings listed above (Waehama et al., 2014; Sekheshin 2016).

## 3.3 The Extending the Original UTAUT Model

Despite the Original UTAUT's proven reliability and widespread acceptance as a model for predicting acceptance of new technologies, there may still be room for it to be improved. In particular recent studies recommended the extension of the UTAUT (Lin and Anol 2008; Wang et al. 2009; Williams et al. 2015; Dwividi et al. 2017).

Previous models from the literature a source of constructs which may be added to the UTAUT. The Social Cognitive Theory model (SCT) suggests that Self Efficacy is the result of interactions between Affect, the degree to which the worker likes their job, and anxiety about their ability to perform it (Bandura 1986). The Model of Perceived Consequences (PC) hypothesises that computer use is the result of a complex series of factors, including the Social Factors and Facilitating Conditions suggested used by the UTAUT, Affect used by SCT, along with Complexity, Long Term Consequences and Job Fit (Thompson et al. 1991). Finally the Motivational Model (MM) applies motivational theory to computer use, and suggests interactions between Extrinsic Motivation, rewards for performing the job and Intrinsic Motivation, the satisfaction of working with a computer (Davis et al. 1992).

Table 3.2 Acceptance Models that contributed to the Extended UTAUT

| **Models** | **Determinants of Behaviour** |
|---|---|
| Original Unified Theory of Acceptance in Use of Technology (UTAUT) | Effort Expectancy + Performance Expectancy + Social Influence = Behavioural Intention + Facilitating Conditions = Use Behaviour |
| The Social Cognitive Theory (SCT) | Self-Efficacy + Outcome Expectations + Affect |
| The Motivational Model (MM) | Intrinsic Motivation (Enjoyment And Fun) + Extrinsic Motivation (Perceived Usefulness) |
| The Model of Perceived Consequences (PC) | Beliefs + Affect + Social Norms + Perceived Consequences + Habit + Facilitating Conditions |

Source: Adapted from Chen and Dimitrova 2006 and Waehama et al. 2014.

Four more constructs have been taken from these models and added to the Original UTAUT to refine the UTAUT.

The first additional construct is Anxiety, defined as the users concerns about the GFMIS. Anxiety was used previously by SCT (Bandura 1986), used later in a number of modelling studies (Igbaria and Ivari 1995; Ellis and Allaire 1999; Carlsson et al. 2006; Czaja et al. 2006) and recommended to be added to the UTAUT by Williams et al. (2015) and Dwividi et al. (2017).

The second new construct, Attitude, is defined as the extent to which the user has positive or negative feelings about using the GFMIS. Attitude is related to the effect of "Beliefs" in the PC (Thompson et al. 1991), and was used in Suoranta and Mattila (2004) and Williams et al. (2011), and whose addition to the UTAUT was derived by a comment by Dwividi et al. (2017), noting the lack of the UTAUT to evaluate and conceptualize the users or intended users.

The third additional construct, Self-Efficacy, is defined as how the user perceives their own effectiveness in using the GFMIS. Self-Efficacy was used previously by SCT (Bandura 1986), and featured in a number of modelling studies (Bandura 1977; 1992; 1997; Tshcannen-Moran and Gareis 2004), and recommended to be added to the UTAUT by Williams et al. (2015) and Dwividi et al. (2017).

The last new construct, Perceived Credibility, is defined as what the user thinks about the ability of the GFMIS to function as promised (Khan and Pessoa 2010). This is related to the

effect of “Extrinsic Motivation (Perceived Usefulness)” in the MM (Davis et al. 1992), and has been used in Sharma (2007) and Khan and Pessoa (2010), and whose addition to the UTAUT was derived by a comment by Dwividi et al. (2017), noting the lack of the UTAUT to evaluate and conceptualize the users or intended users.

This was done while retaining all four original constructs from the Original UTAUT: Effort Expectancy, Performance Expectancy, Social Influence and Facilitating Conditions (Venkatesh et al. 2003). All but one of the constructs is expected to be unidimensional, that is, the product of a single underlying process. Self-Efficacy, which can reflect very real concerns about technical competency as well has wholly imaginary problems with self-image, is expected to be multidimensional.

Table 3.3 Construct Dimensionality

| Construct | Expected Dimensionality |
|---|---|
| Effort Expectancy | Expected to be unidimensional.<br>Adopted from Venkatesh et al. 2003; Dulle and Minishi-Majanja 2011; San and Herrero 2012 |
| Performance Expectancy | Expected to be unidimensional.<br>Adopted from Venkatesh et al. 2003; Alkhumiazan and Love 2012 |
| Social Influence | Expected to be unidimensional<br>Adopted from Venkatesh et al. 2003; Fan et al. 2005; Alkhuniazan and Love 2012 |
| Facilitating Conditions | Expected to be unidimensional.<br>Adopted from Venkatesh et al. 2003 |
| Anxiety | Expected to be unidimensional.<br>Adopted from Bandura 1986; Igbaria and Ivari 1995; Ellis and Allaire 1999; Carlsson et al. 2006; and Czaja et al. 2006 |
| Self-Efficacy | Expected to be multidimensional.<br>Adopted from Bandura 1977; 1986; 1992; 1997; Tshcannen-Moran and Gareis 2004 |
| Perceived Credibility | Expected to be unidemensional<br>Adopted from Davis et al. 1992; Sharma 2007; Khan Pessoa 2010 |
| Attitude | Expected to be unidimensional<br>Adopted from Thompson et al. 1991; Suoranta and Mattila, 2004; Williams et al. 2011 |

To give the name greater specificity in this study, Behavioural Intention was renamed Intention to Use Future Technologies. Gender, Age and Education Level were put forward as mediating factors. The constructs, and the hypotheses associated with them, are described in detail in the following section.

## 3.4 Factors and Hypotheses

### 3.4.1 Independent Variables

Independent variables used in this study include the four from the original UTAUT: Effort Expectancy, Performance Expectancy, Social Influence and Facilitating Conditions, along with four from other models: Anxiety, Attitude, Self-Efficacy and Perceived Credibility.

#### *3.4.1.1 Effort Expectancy*

Effort Expectancy is the degree of ease associated with the use of the system and refers to the extent to which an individual believes (or expects) a new system will be easy to use; in other words, Effort Expectancy is the level of ease or effort required to integrate a system within the workplace (Venkatesh et al. 2003). Consequently, according to early work by Venkatesh et al. (2003) Effort Expectancy has a significant positive influence on employee intention to exploit the ICT for better performance. Dulle and Minishi-Majanja (2011) stated that Effort Expectancy plays an increasingly important role in the acceptance of technology by people, while AlAwadhi (2009) revealed the dominant role of the UTAUT included Effort Expectancy in students' intentions to use the e-government services. San and Herrero (2012) stated that Effort Expectancy is notably similar to the factor defined as perceived-ease-of-use in the TAM.

Experience with information and communications technology negatively influenced Effort Expectancy's effect on Intention to Use in several studies (Davis 1989; Szaijna 1996; Schaupp and Carter 2005; and Al-Gahtani, 2007). Venkatesh et al. (2003) and Malhotra (2005) determined that Effort Expectancy decreases when experience on the system increases. A UTAUT-based study determined that Effort Expectancy was not significant for businesses' intent to use mobile advertising (He and Lu 2007) or 3G mobile communication (Wu, Tao and Yang 2007). A meta-analysis of previous research determined that Effort Expectancy was not relevant in predicting use behaviour or intention to use technology (Taiwo and Yang 2007). However, based on the work of Venkatesh (2003) and Dulle and Minishi-Majanja (2011), the following hypothesis was produced in this study:

*Hypothesis 1: Effort Expectancy has a significant positive effect on the Use Behaviour of GFMIS in MOAC*

#### *3.4.1.2 Facilitating Conditions*

Facilitating Conditions exist when an individual believes that organisational and social conditions are in place to support a new system (Venkatesh et al. 2003). The exploration of behaviours towards using technology are affected by external factors and highly influenced by perceptions of Facilitating Conditions. Although Facilitating Conditions normally describes the importance given to organisational factors and related infrastructure-based system support (Venkatesh et al. 2003), aspects like increased experience can also be a Facilitating Condition for adoption according to Vankatesh et al. (2003). Based on these findings, it is possible that Facilitating Conditions could affect the adoption of the GFMIS in the MOAC.

Facilitating Conditions influenced acceptance to use 3G mobile services in Taiwan (Wu et al. 2007); mobile advertising by businesses (He and Lu 2007) and internet banking (Cheng et al. 2008). Students' use of e-government was influenced by Facilitating Conditions (AlAwadhi and Morris 2009). Predictions for "actual use" of a Traffic Violation E-payment System in Kuwait were enhanced by Facilitating Conditions (Khalil and AlNasrallah, 2007, p. 17). Debuse et al. (2008) noted that Facilitating Conditions in the form of institutional support, did have an overall influence on use behaviour of new technology by educators. Intent to use health care technology in Thailand was significantly influenced by Facilitating Conditions (Phichitchaisopa and Naenna 2013). The research found that Facilitating Conditions, Performance Expectancy and Effort Expectancy were the constructs with the most significance for predicting Use Behaviour (Phichitchaisopa and Naenna 2013). Kasim (2015) determined that Facilitating Conditions are positively linked to knowledge sharing behaviour when using virtual platforms. Based on the research on Facilitating Conditions, the following hypothesis was developed:

*Hypothesis 2: Facilitating Conditions has a significant positive effect on the Use Behaviour of GFMIS in MOAC.*

#### *3.4.1.3 Performance Expectancy*

Performance Expectancy factor refers to the level or percentage to which the person considers that usage of a system will contribute in gaining the improved performance in a job (Venkatesh et al. 2003). This factor captures the constructs of Performance Expectancy, motivation, and job fit. Alkhunaizan and Love (2012) assessed the success and growth of mobile commerce using UTAUT model and concluded the role of Performance Expectancy was one of the main drivers in customer Intention to Use mobile commerce. This study, therefore, suggests that the Performance Expectancy as a construct of UTAUT affects the adoption of the GFMIS in the MOAC.

Performance Expectancy was identified as an extrinsic motivator when users are expecting a valid outcome (e.g., promotion, new job) for technology acceptance (Lee et al. 2009; Venkatesh 2003). Intention to use e-government was positively influenced by Performance Expectancy in several countries (Carter and Belanger, 2004b; Schaupp and Carter, 2005; AlAwadhi and Morris 2009). In other sectors, Performance Expectancy was a high predictor for nurses' Intention to use a medical teleconferencing application (Biemans et al. 2005). Performance Expectancy was found to positively influence acceptance of 3G mobile service (Wu et al. 2007); towards mobile advertising (He and Lu 2007); and internet banking (Cheng et al. 2008). In line with these studies, the following hypothesis was developed:

*Hypothesis 3: Performance Expectancy has a significant positive effect on the Use Behaviour of GFMIS in MOAC.*

#### *3.4.1.4 Social Influence*

Social Influence refers to the extent to which others in an individual's (organisational) social circle believe that a new system should be used (Alkhunaizan and Love 2012). Social Influence, in agreement with the definition provided by Venkatesh et al. (2003) refers to the level of pressure that a person perceives from social factors for using new systems. In other studies using TAM, Alkhunaizan and Love (2012) have determined the importance of social factors for improving the cogency and overall power in intranet's involvement and acceptance. Moreover, Fan et al. (2005) established that user increases in acceptance and reference to others are dependent on the level of satisfaction that one generates from a system.

Debuse et al. (2008) found that Social Influence had no significant importance in educators' decisions to use an automated feedback system to communicate with their students rather than face-to-face meetings. Meanwhile, Social Influence was insignificant for adoption of Kingdom of Saudi Arabia (KSA) e-government (Alshehri et al. 2012a). Social Influence was found to be statistically insignificant for students' adoption of information and communications technology in a study by Attuquayefio and Addo (2014) and Social Influence did not influence students' adoption of an email system (Alraja 2015). Nevertheless, based on the research from Alkhunaizan and Love (2012) and Fan et al. (2005), the following hypothesis was employed for this study:

*Hypothesis 4: Social Influence has a significant positive effect on the Use Behaviour of GFMIS in MOAC.*

#### *3.4.1.5 Anxiety*

Intuitively, Anxiety has the potential to have negative implications on a person's readiness to accept a new system and thus be an important variable affecting technology adoption. Computer anxiety has been shown to significantly impact technology adoption by some studies. Ellis and Allaire (1999) concluded that computer anxiety significantly impacted information technology use and technology adoption in the government. Carlsson et al. (2006) found that computer anxiety had a considerable impact on the model in a study on factors influencing mobile usage in Thailand. Anxiety showed a negative effect (-27%) on Intention to Use for the e-government model of the internal users in Indian Central Excise (Sahu and Gupta, 2009).

On the other hand, Anxiety did not show implications for Intention to Use in other studies. Venkatesh et al. (2003), cited by AlShafi and Weerakkody (2009), found that Anxiety did not directly Influence the Intention to Use. AlAwadhi (2009) also found that Anxiety does not determine intention to Use for particular types of technology. Malik et al. (2016) found that a role for Anxiety was not supported by their model based on e-government adoption and Intention to Use at Punjab in Pakistan. Anxiety was not significant in the UTAUT model developed to assess e-district adoption in Assam, India (Baishy et al. 2017).

The following hypothesis was developed based on the research results in Thailand and India (Ellis and Allaire 1999; Carlsson et al. 2006; Sahu and Gupta 2009).

*Hypothesis 5: Anxiety has a significant positive effect on the Use Behaviours of GFMIS in MOAC*

#### *3.4.1.6 Attitude*

Attitude is another external variable that appears with increasing frequency in studies associated with the UTAUT framework (Williams et al. 2011). It was added to the original model proposed by Venkatesh et al. (2003) referring to the extent to which an individual has positive or negative feelings about using a new system (Suoranta and Mattila 2004).

Williams et al. (2011) concluded the role of Attitude to be considerable in the users' intention of using mobile banking. Alkhunaizan and Love (2012) found that the attitude towards technology adoption in the mobile banking industry has a considerable impact on technology acceptance in general.

Attitude was not shown to be a direct determinant for Intention to Use (AlAwadhi and Morris 2008; Nawaz and Thelijjagoda 2015). Attitude was removed from this model, a precursor of UTAUT, after refinement of the model (Carter and Belanger 2005). In a comparison of the UTAUT with an Entrepreneurial Potential Model, Attitude in the UTAUT model was not determined to be a direct determinant (Moghavvemi et al. 2013). Attitude was not determined to be significant and was removed as a construct in a UTAUT assessing e-government (AlAwadhi and Morris 2008; Nawaz and Thelijjagoda 2015). Nevertheless, hypothesis 6 was developed based on the research that showed an impact from Anxiety to Influence to Use.

*Hypothesis 6: Attitude has a significant positive effect on the Use Behaviours of GFMIS in MOAC.*

#### *3.4.1.7 Self-Efficacy*

Self-Efficacy refers to an individual's self-perception of themselves concerning effectiveness (Tschannen-Moran and Gareis 2004). The measurement of an individual's self-perception on how well they can effectively use modern technology was chosen as a predictor of an individual's intention to use e-government services and their intention to use the services in the future.

The variable Self-Efficacy indirectly affects an individual's performance and motivation, but no direct influence was identified in early models (Bandura and Adams, 1977; Bandura et al. 1992). Self-Efficacy was not added as a construct in the model developed by Venkatesh et al. (2003), because it was not considered as a direct determinant for Use Behaviour or Intention to Use. Self-Efficacy is an indirect construct of entire perception of computer self-efficacy towards a specific system (Venkatesh et al. 2003; Straub 2009). The individual characteristic of Self-Efficacy is not measured by the UTAUT as a direct construct of "behavioural intention" (Moghavvemi, Salleh and Abessi 2013: 249).

Self-Efficacy is a factor of the SCT that has been developed by Bandura and Adams (1977). He built a triad reciprocity level model from traditional social cognitive theories but included more information to understand the complex behaviour of Self-Efficacy (Bandura and Adams 1977; Bandura et al. 1992; Bandura 1997). According to Hung et al. (2006), the intention to use e-government and the intention to continue to use e-government are based on many factors, including the users' perception of Self-Efficacy when using technology (Hung et al. 2006). Therefore, the following hypothesis was proposed for this study:

*Hypothesis 7: Self-Efficacy has a significant positive effect on the Use Behaviour of GFMIS in MOAC.*

#### *3.4.1.8 Perceived Credibility*

Perceived Credibility is a measure of what the user thinks about the ability of the product (or technology in this case) to deliver its promised benefit (Khan and Pessoa 2010). The assumed usefulness of a product or service can be defined simply regarding the utility of the system to the user and the perceived ease of usage, which is defined as how the user views how easily a given system may be used, particularly by individuals who are not highly skilled with computers. According to the study by usage of Government Financial Management Information System Project (Khan and Pessoa 2010), the different aspects of Perceived Credibility are the perceived benefits, cost, and perceived control of behaviours, the assumed usefulness of the service, and the presumed ease of use. Another aspect of Perceived Credibility is the perceived risk, defined as the fear of losing one's personal information and the fear of being monitored through the internet associated with the technology (Sharma 2007).

Although intuitively Perceived Credibility could have a great impact on Intention to Use and Use Behaviour, many studies have not found this to be the case. Perceived Credibility was not found to have a direct relationship with individuals' Use Behaviour and Intention to Use in studies using the UTAUT model into: e-banking in Malaysia (Yeow et al. 2008; YenYuen and Yeow 2009), e-government smart cards (Loo et al. 2009), e-banking in developing versus developed countries (Yuen 2010) and e-banking with mobile technology (Yuen et al. 2010). Dwivedi et al. (2011) compared the Perceived Credibility construct in UTAUT and in other models including TAM, SCT, Innovation Diffusion Theory, and Extended TAM, but found that Perceived Credibility did not have significance as a construct for behavioural intention. Williams et al. (2011) carried out a research study on the Major UTAUT variables and external variable relationships; the researchers found that Perceived Credibility did not have a significant influence on behavioural intention. In spite of these findings, the following hypothesis was developed:

*Hypothesis 8: Perceived Credibility has a significant positive effect on the Use Behaviours of GFMIS in MOAC*

### 3.4.2 Dependent Variables

The hypotheses of this study take into account all the aforementioned independent variables' influences on the dependent variables. The dependent variables present within the study consist of the Use Behaviour and the Intention to Use Future Technologies. In some models, including this one, Intention to Use Future Technologies is viewed as an antecedent of Use Behaviour in new technology adoption (Venkatesh et al. 2007).

#### *3.4.2.1 Intention to Use Future Technologies*

Use Behaviour is an antecedent of Intention to Use Future Technologies in the Extended UTAUT model. People are more likely to cope with the task of accepting and using new technologies when they have an active Intention to Use Future Technologies. Users need to understand why they need new technologies, what they can expect to experience, and what benefits they will receive (Legris et al. 2003). Intention to Use Future Technologies has the potential to transform into the actual adoption of technology, but often after a time lag. In contrast, Use Behaviour happens in the present.

*Hypothesis 9: Intention to Use Future Technologies has a significant positive effect on the Use Behaviours of GFMIS in MOAC.*

#### *3.4.2.2 Use Behaviour*

The Use Behaviour defines the level of acceptance of technology by the organisation (AlAwadhi 2009), and also determines the user's intention to perform certain tasks. This extension is endorsed by Venkatesh et al. (2007) in which it has been determined that success of the UTAUT model also requires the inclusion of this dependent variable. It is imperative to consider this variable in the model in this study, as eventually, it conditions the success of the whole process of technology acceptance.

### 3.4.3 Demographic Variables

The three main demographic factors collected in this study are Age, Gender and Education Level of the survey participants, employees of Thailand's MOAC. According to literature, income level is a significant factor in the adoption of new technologies (Al-Ghaith, Sanzogni and Sandhu, 2010; Abu-Shanab, 2013; Hoe Hong et al., 2013). However in this study, it was known that there was unlikely to be much variation in this variable among survey respondents and, consequently, there would have been little point in testing for it.

#### *3.4.3.1 Age*

Younger people tend to accept new technology more eagerly than older people due to their readiness to perceive new information and master it (Lu et al. 2003). Early research by Venkatesh (2000) observed four variables with an influence on Use Behaviour that were moderated by Age: Effort Expectancy, Facilitating Conditions, Performance Expectancy and Social. More recent research showed that Age moderates "Behavioural Intention" (Yu 2012) known in our study as Intention to Use Future Technologies.

Early research on Use Behaviour and Intention to Use new technology was carried out by Lu et al. (2003), who studied academic published literature concerning the adoption and use of wireless Internet on mobile devises with TAM. They found that young people were more likely than their elders to use new technology (Lu et al. 2003). Similarly, Yu (2012) found Age is a moderating influence on usage and other factors that define a customer's adoption and system acceptance of mobile banking. The following hypothesis was developed to address the moderator of age.

*Hypothesis 10: There is a significant difference in each predictive factor according to the Age group.*

#### *3.4.3.2 Gender*

Gender is a variable often studied in technology acceptance research; in some studies men and women are influenced by different factors (Venkatesh 2000). Perception of usefulness is the most important for men, whereas perception of ease of use is most important for women (Venkatesh 2000). Meanwhile Venkatesh et al. (2003) reported that men focus on tasks at hand more strongly than women. Moderating effects for women concerning the intention to use internet services included low Self-Efficacy and higher computer anxiety than men reported (Nysyeen et al. 2005). Gender is an important variable to consider for gaining insight into general usage tendencies when the study takes place at a specific location Gender moderated the relationships with latent variables of SEMs.

Some research reports Gender differences while some report no Gender differences. Two research studies using UTAUT found that adoption in two Persian Gulf countries, UAE and Qatar, demonstrated that gender was a significant moderator of e-government, with adoption by females was lower than by males (Al-Shafi and Weerakkody 2009; Rodrigues et al. 2017). Igbaria and Iivari (1995) noted that the reports on user acceptance of microcomputer technology were inconclusive. On the other hand, Gupta et al. (2008) implemented a similar study to the current research using UTAUT to assess ICT adoption of government in Southeast Asia; they did not discern any differences between Genders. The following hypothesis was developed to explore the role of gender.

*Hypothesis 11: There is a significant difference in each predictive factor according to Gender.*

#### *3.4.3.3 Education level*

A literature review reported that 16 studies addressed links between Education Level and other dependent constructs for employees and citizens in terms of e-government (Williams et al. 2014). The variable education level has been found to influence technology acceptance and use. The higher a person advances through the educational system; the more comfortable they are using their skills and knowledge for personal development through new opportunities including technology acceptance (Mathieson, et al. 2001). Many people with high levels of education perceive technology as a component of probable success, which becomes a great motivation for further learning and eventual technology acceptance and proficient use (Legris et al. 2003).

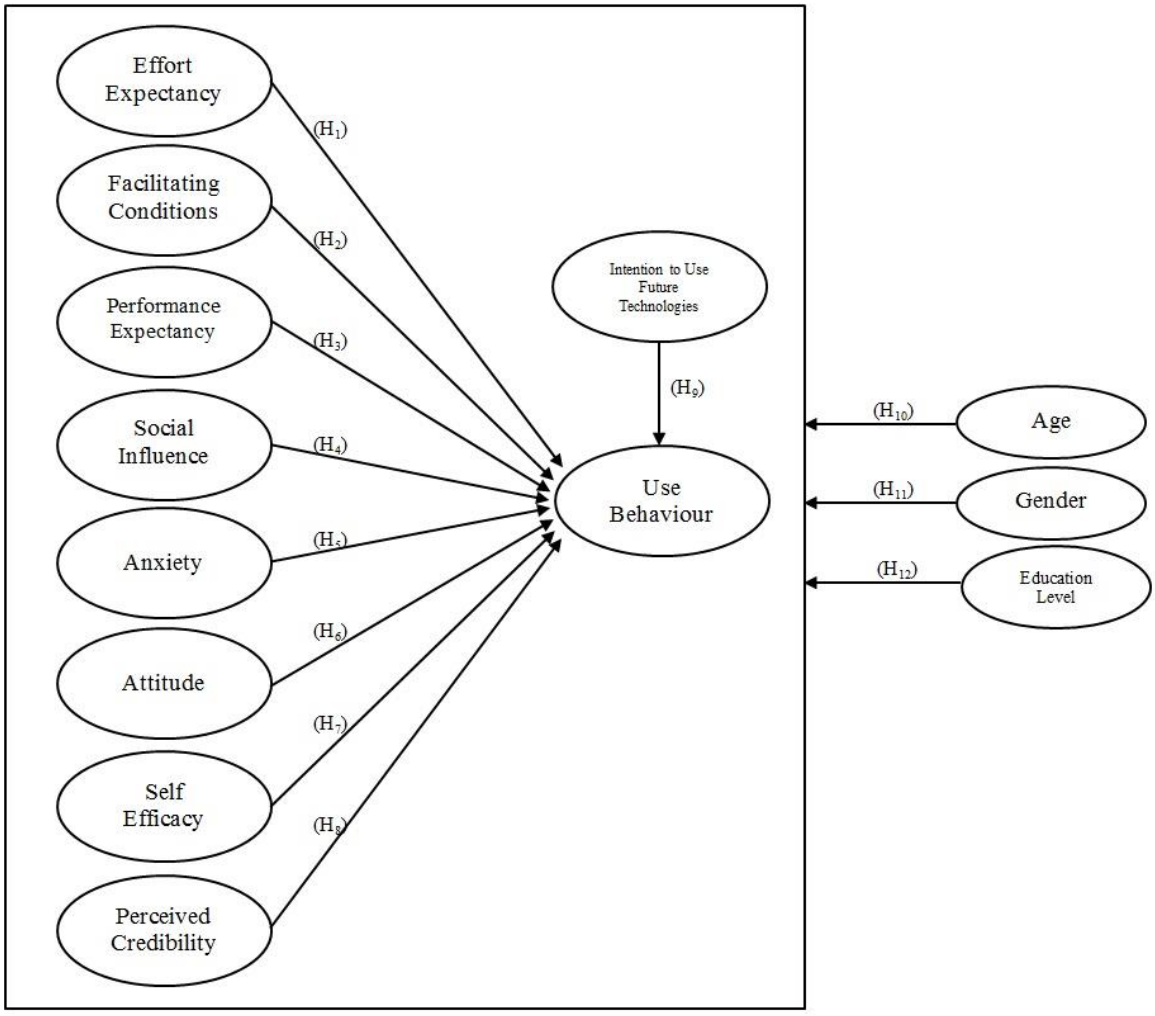
The use of e-government was reported as higher when education levels were higher (Akman et al. 2005). A college education was found to increase comfort level of individuals 50 years and older for technology use (Leppel and McCloskey 2011). On the other hand, people with all educational levels were shown to adopt e-government (Rodrigues et al. 2016). The following hypothesis was developed to address Educational Level.

*Hypothesis 12: There is a significant difference in each predictive factor according to Education Level.*

### 3.5 Extended UTAUT Model Conceptual Framework

The conceptual framework for the Extended UTAUT which is used to model GFMIS use by the MOAC of Thailand is shown on Figure 3.2. The dependent construct Use Behaviour is potentially affected by the independent constructs Effort Expectancy, Performance Expectancy, Social Influence, Facilitating Conditions, Anxiety, Attitude, Self-Efficacy and Perceived Credibility. Precedent from the Original UTAUT suggests that some or all of them may interact with the other dependent construct, Intention to Use Future Technologies, which then goes on to affect Use Behaviour. Age, Gender and Education Level may moderate the interactions between the independent and dependent constructs, and Intention to Use Future Technologies and Use Behaviour.

Figure 3.2 Conceptual Framework of the Extended UTAUT Model for the Current Study



## 3.6 Conclusion

In order to find out what factors influence use of the GFMIS by the MOAC of Thailand, this study has opted to use the widely-accepted Original UTAUT model proposed by Venkatesh et al. (2003). This model is made up of four independent variables: Effort Expectancy, Performance Expectancy, Social Influence and Facilitating Conditions, whose effects on two dependent variables: Behavioural Intention and Use Behaviour are moderated by four other factors Gender, Age, Experience of the user and Voluntariness of Use. The Original UTAUT was built up by incorporating features of a number of previous models, including the TRA, TPB and TAM.

The UTAUT model has mostly been used in developed countries and thus may not be appropriate for a country like Thailand. In a manner analogous to how the Original UTAUT was developed from previous models, an UTAUT was extended by adding variables from other constructs, including the SCT, PC and MM. The Extended UTAUT includes eight dependent variables; the four from the original plus Anxiety, Attitude, Self-Efficacy and Perceived Credibility, acting upon Behavioural Intention (renamed Intention to Use Future Technologies and Use Behaviour) and Use Behaviour. The demographics of Age, Gender and Education Level are put forward as possible moderating factors. The process whereby this model was used to devise a questionnaire, which was put to the employees of MOAC, and the results of which were and subsequently statistically tested and analysed is described in Chapter 4.

# CHAPTER FOUR
# RESEARCH METHODOLOGY

## 4.1 Introduction

This section details how the study to determine what factors influence the use of the Government Fiscal Management Information System (GFMIS) by employees of the Ministry Of Agriculture and Corporation (MOAC) of Thailand was designed, implemented and statistically analysed. The study employs a descriptive research design by using for GFMIS adoption predictors (De Vaus 2006), and a quantitative approach in which numerical and statistical data is collected using validated and structured data collecting instruments (Lichtman 2006). A survey questionnaire recording demographic information and data relating to GFMIS use was designed in English and translated into Thai. 600 copies of this questionnaire were made available to employees from twelve departments of the MOAC, self-administered on an entirely voluntary basis and collected the next day. The resulting data was then analysed, principally using Structural Equation Modelling (SEM) techniques to create a model of what factors influence GFMIS usage and how they do so, and then using non-parametric tests if and which of these factors are subject to demographic influences.

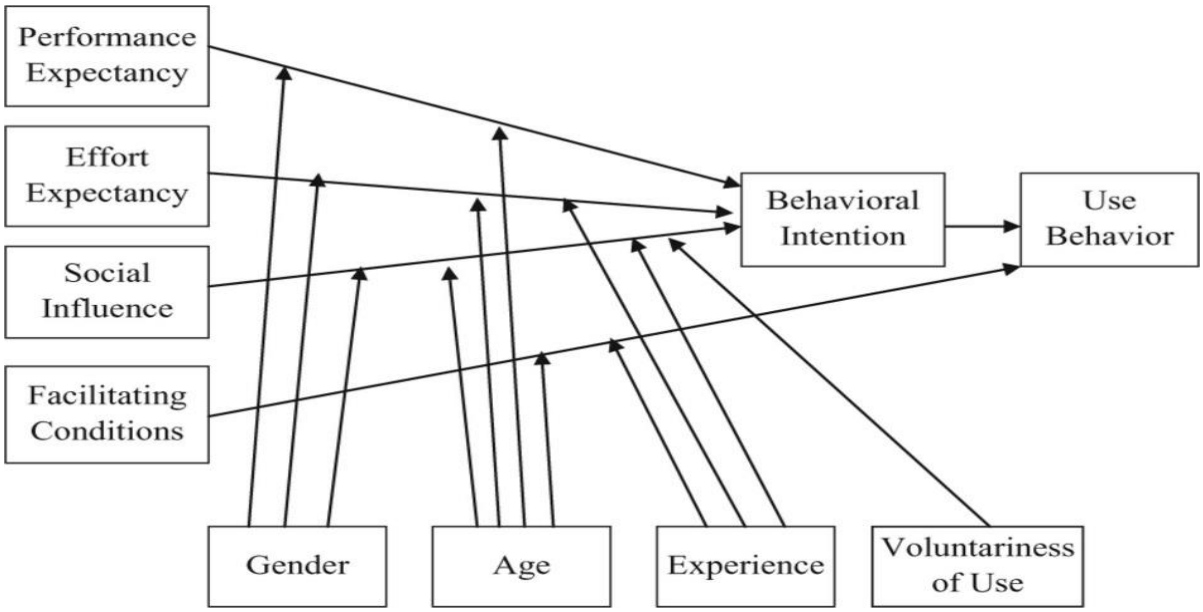
## 4.2 Research Approach

This study sought to develop a model to assess the factors that influence employee acceptance of GFMIS within the MOAC. Although several models are available to examine model user acceptance of information and communications technology, the UTAUT model developed by Venkatesh et al. (2003) is the best proven and most generally accepted. This study built upon the UTAUT model from Venkatesh et al.'s (2003) model in the context of GFMIS at MOAC. To distinguish between these two models, the model proposed by this thesis is referred to as the 'Extended UTAUT model' and the model originally developed by Venkatesh et al. (2003) as the 'Original UTAUT model'.

The Original UTAUT model (see Figure 4.1) had four independent variables (Effort Expectancy, Facilitating Conditions, Performance Expectancy and Social Influence), two dependent variables (namely, Behavioural Intention and Use Behaviour), three demographic

variables (Gender, Age and Experience) and a usage variable (Voluntariness of Use). There are five testable hypotheses in the Original UTAUT model.

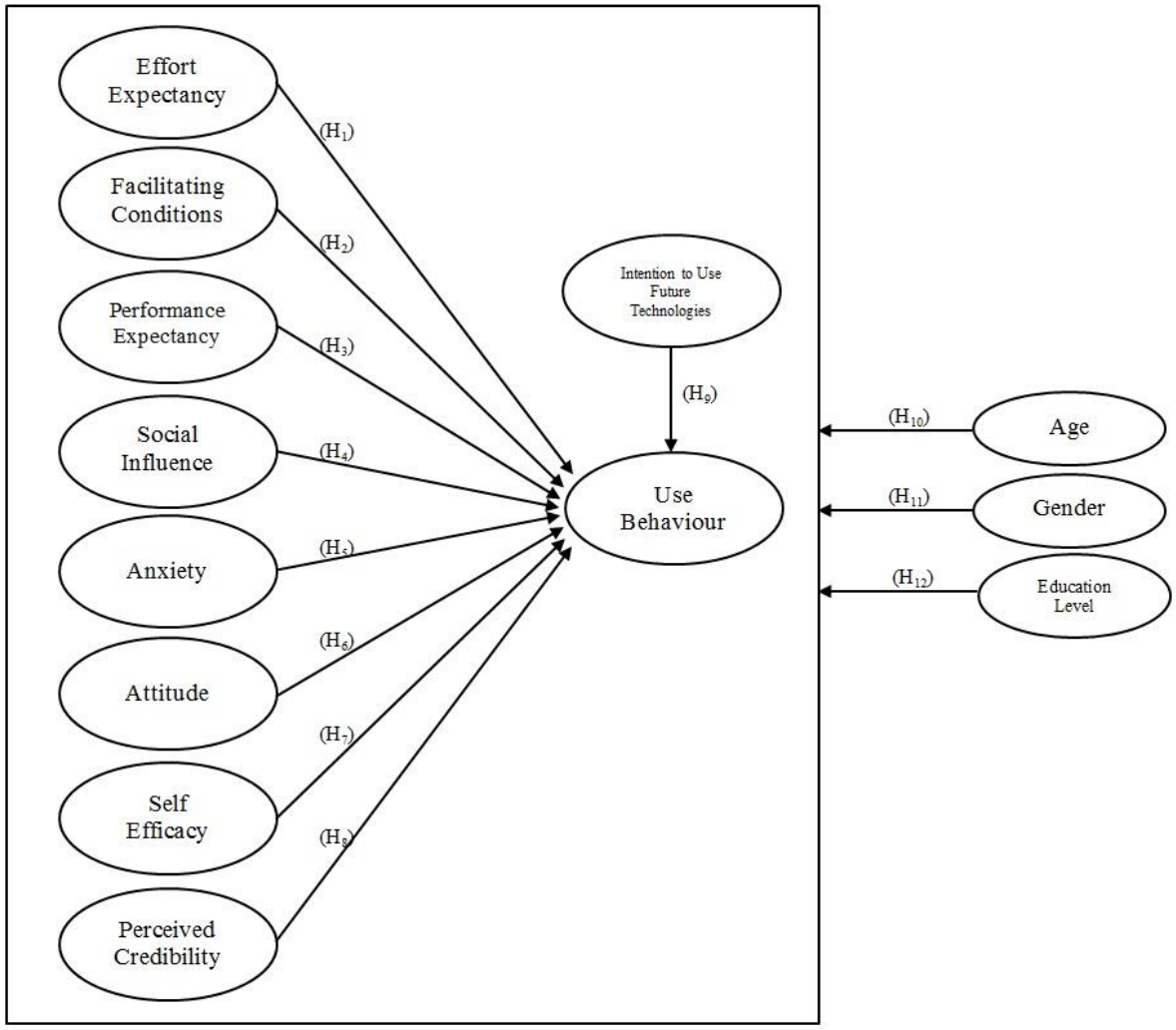
Figure 4.1 The Original UTAUT model




Source: Venkatesh et al. 2003

In contrast, the Extended UTAUT model (see Figure 4.2) has eight independent variables, four in common with the Original UTAUT model (Effort Expectancy, Facilitating Conditions, Performance Expectancy and Social Influence) and four new (Anxiety, Attitude, Self-Efficacy, and Perceived Credibility), two dependent variables, both similar to those used by the Original UTAUT model (Intention to Use Future Technologies and Use Behaviour) and three demographic variables (Age, Gender and Education Level). There are 12 testable hypotheses in the Extended UTAUT model.

Figure 4.2 The Extended UTAUT Model




This study was intended to explore the data fit to the Extended UTAUT model in the context of GFMIS at MOAC. The study used a sample of employees within the MOAC and its research results are expected to be generalisable to all government departments and agencies.

### 4.3 Questionnaire Design

In order to gather the raw data for this study, a questionnaire was designed to identify the factors that influence GFMIS adoption by MOAC's employees. The first page of the questionnaire described the purpose of the data collection exercise and self-guiding instructions on how to fill the questionnaire. The second page recorded demographic information, including Gender (male or female), Age (sub-grouped into the responses 18 to 24, 25 to 34, 35 to 44, 45 to 54 and 55 to 64) and Education level (sub-grouped into the responses high school, college,

bachelor degree and master degree). All of these demographic factors can be classified as nominal data, which is classified into mutually exclusive categories in which members/subjects in each category share the same characteristic.

The remaining pages focussed on ten questions relating to factors in the adoption and use of the GFMIS. Each question focussed on one of the variables identified in the Extended UTAUT model: the independent variables Effort Expectancy, Facilitating Conditions, Performance Expectancy, Social Influence, Anxiety, Attitude, Self-Efficacy, Perceived Credibility and the dependent variables Use Behaviour, and Intention to Use Future Technologies. Each question encompassed a series of attitudinal statements, to which respondents were invited to record their agreement or disagreement with using the Likert scale. The Likert Scale is a measurement commonly used for obtaining data from participants so that the answers can be mathematically compared (Robinson 2014). The Likert scale has seven levels of response: 1: strongly disagree, 2: disagree, 3: slightly disagree, 4, neither agree nor disagree, 5: slightly agree, 6: agree, 7 strongly agree. This numerical response allows data to be mathematically compared and analysed. Given that the data from the Likert scale is are assigned numbers that provide a ranking, it can be classified as ordinal data. The fully developed questionnaire is displayed in Appendix 1.

The participant interpretations are a measure of the systematic addressing of relevant metrics and factors that can influence the comprehensive analysis of the GFMIS. The interpersonal effects and personal benefit are shown in the structuring of the questionnaire. The simpler and more straightforward questions are placed first to invoke a simple exploration of the GFMIS.

The questionnaire was originally developed in English, and translated into Thai by a proficient translator (see Appendix 2 for Thai version of the questionnaire). To ensure that the meaning of the questionnaire was not lost in translation, the translated questionnaire was subsequently translated back in the English language by another individual who was fluent in both the Thai and English languages. Since no such loss of meaning was detected, the English version of the completed questionnaire was submitted to Victoria University's Ethics Committee (see Section 4.4).

Following the approval of the questionnaire by the Ethics Committee, a pilot test was performed for an evaluation of the 'adequacy of the questionnaire' (Veal 2005; Iarossi 2006).

Specifically, the pilot test determined if the questions reflected the variables under investigation, if the questions were easily understandable, if the questionnaire format was logical, and whether the questionnaire could be completed within the required timeframe. Since the pilot study identified no difficulties in these areas, it was passed unamended for the full scale study.

### 4.4 Ethical Considerations

Sekaran (2000, p.17) refers to ethics in business research as "a code of conduct or expected social norm of behavior while conducting research". Compliance with ethical standards in research is very important for setting boundaries pertaining to what the researcher can and cannot do especially when health, safety and well-being of human or animal are involved in the research process. Ethical lapses in research can not only harm human and animal (who are subjects of a study) but may also harm other individuals related to these subjects as well as the community at large. In addition, this misconduct can also jeopardise the reputation of the organisation with which the researcher is affiliated. Hence, it is important for researchers to understand the importance of ethical research and diligently fulfil ethical requirements (Polonsky and Waller 2005).

In accordance with this, as part of Victoria University requirements, all projects which involve people as subjects must have approval from the University Human Research Ethics Committee before conducting of any fieldwork. This requirement applied to the current study. First, in the ethics application, the researcher addressed the issues of participant privacy and confidentiality: the procedures aim to ensure that there are no potential risks associated in this project. Second, the Thai language questionnaire was translated by an accredited person. The detailed information included the aims of the study, its significance to them, the intended use of data and the issues with regard to the ensuring confidentially. As part of the Victoria University requirement, consent forms for conducting this research were obtained from respondents in the study.

There are various ethical issues that this study observed and complied with which are voluntary participation, informed consent, the risk of harm, confidentiality, and anonymity. This section discusses these ethical issues and identifies how the study addressed them. Voluntary

participation requires that the study participants should not be coerced into being part of a study against their will. It is closely linked to informed consent which requires that study participants should be fully aware of what risks and procedures that they will be exposed to before giving their consent. Jackson (2012) argues that a signed consent form should be part of any study where human subjects are involved. The current study ensured voluntary participation and informed consent by including a signed consent form as part of the questionnaire. Before signing the consent form, the participants were provided with instructions on what was expected from them. They were also informed that they had a right to decide whether to participate in the study or not. They were not coerced to participate in the study. However, they were encouraged to participate.

A study should ensure that the risk of harm that study participants are exposed to is minimised. The current study does not involve any experiments. Study participants were only required to fill in questionnaires. Therefore, there is minimal exposure to any risks. Besides, approval from the University Human Research Ethics Committee was sought before the fieldwork, and it was granted. Seeking the committee approval is part of Victoria University requirements for any study that involves human subjects. The purpose is to ensure the study complies with the ethical standards of social research. The approval granted by this committee is an indication that the study meets the standard ethical expectations for social research.

The following processes were performed to ensure confidentiality:

1) The names of the respondents were kept confidential as well as anonymous
2) Personal information of the respondents was not identified in any of the findings
3) The raw data that was collected has not been used for any other purposes than this study and;
4) Data were kept in a safe location

## 4.5 Research Setting and Frame

The research setting was the offices of the MOAC in Thailand, in particular the Office of Agricultural Economics, the Cooperative Auditing Department, the Rice Department, the Department of Livestock Development, the Department of Agriculture, and the Queen Sirikit Department of Sericulture, the Royal Irrigation Department, the Land Development Department, and the Department of Royal Rainmaking and Aviation, the Department of Cooperative Auditing, the Department of Agricultural Extension and the Department of Fisheries. Although the population is finite, the exact population size was unknown to the researcher. The sample frame was the employees at the MOAC from these 12 departments that used the GFMIS, known to be 867 people at the time of the survey (OCSC 2017).

## 4.6 Sampling Size and Procedures

600 questionnaires were physically handed out to the 12 departments of the MOAC, their completion was self-administered and they were then physically collected on the following day. The useable sample size was 315 due to incomplete questionnaire and deletion of outliers. See section 5.2.1 for a further discussion.

## 4.7 Data Screening

Data screening was conducted as a preliminary preparation for data analysis. Data screening procedures were meant to deal with missing values, detecting outliers and data normality.

### 4.7.1 Missing Data

Not all the questionnaires were fully completed, resulting in some variables missing data for some of the respondents. In this study, cases with such missing data were completely removed from the final analysis (see Section 5.2.1 for number and proportions of cases removed on these grounds).

### 4.7.2 Detecting Outliers and Normality

An outlier is a data point that is far outside the norm for a variable or population, arousing suspicions that it was generated by a different mechanism (Osborne and Overbay 2004). Since the presence of outliers can lead to inflated error rates as well as substantial distortions of parameter and statistic estimates when using either parametric or nonparametric tests (Osborne and Overbay 2004), cases identified as outliers were removed from the final analysis.

Outliers were detected in this study using two tests. Initially, univariate outlier analysis was performed using SPSS version 24, with cases with a Z-score greater than 3.29 or less than -3.29 being classified as outliers and removed from the final analysis. Subsequently, the Mahalanobis d-squared test was performed using AMOS version 24 to detect multivariate outliers. Responses with a *p*-value less 0.05 were deemed to be influential outliers and removed from the final analysis (see Section 5.2.1 for number and proportions of cases removed on these grounds).

## 4.8 Demographics and Descriptive Statistics

Frequency distribution of Gender, Age and Education Level was determined using the SPSS version 24 software package (see Sections 5.2.2 for results). Means and standard deviations for responses to the questionnaire statements were also calculated using the SPSS version 24 software package (see Sections 5.2.3 for results).

## 4.9 Structural Equation Modelling

The modelling process for determining how the independent variable constructs acted on the dependent variable constructs, along with how items interacted to influence a given construct, was based on Structural Equation Modelling (SEM). Kaplan (2008: 1) defines SEM as *"a class of methodologies that seeks to represent hypotheses about the means, variances and covariance of observed data in terms of a smaller number of 'structural' parameters defined by a hypothesised underlying model."* In contrast to the ordinal regression analysis correlates two data points at a time; SEM considers all the equations simultaneously. Therefore, it allows considerations of situations in which a variable maybe a dependent variable in one equation

and an independent variable in another equation (Edwards and Bagozzi 2000). SEM is designed to evaluate how well a proposed conceptual model containing observed indicators and hypothetical contacts explains or fits the collected data (Bollen and Long 1993). SEM allows graphical expression of the interrelationships between the system of regression equations through path diagrams (Edwards and Bagozzi 2000). The path diagrams provide the current study a convenient way to create a visual impression of the otherwise complex set of interrelated linear relationships.

SEM, like most statistical tools, makes certain assumptions and requires a dataset to meet certain criteria before in order for it to be analysed accurately. First, the variables under consideration should be normally distributed (Field 2000). Random sampling improved the chances of a normally distributed dataset, working on the assumption that the population of the MOAC that the dataset was attempting to represent was normally distributed. Eliminating both univariate and multivariate outliers also assisted in giving the dataset a normal distribution.

Second, there is a need to take into account the sample size. The sample size has a bearing on the reliability of the findings (Field 2000; Habing 2003). Field (2000) points out that various authors have proposed several "rules-of-thumb" for appropriate sample size, though these vary greatly. For instance, Field (2000) argues that research needs at least ten subjects for each variable, and Habing (2003) raises the threshold to at least 50. Meanwhile Schumacker and Lomax (1996) put forward 250 as a minimum sample size, while Hox and Bechger (1998) reviewed several studies and concluded that the minimum sample size was 300. Given that 600 questionnaire forms were provided for the survey, it was believed that enough would remain after data screening to meet even the most extensive of these requirements.

### 4.10 One-Factor Congeneric Modelling

In order to determine what items belonged in the model for a given construct a form of SEM called Confirmatory Factor Analysis (CFA) was employed. CFA allows the validity and reliability of each of the constructs to be assessed, as well as that of the entire model that combines all the constructs. Therefore, it allows the researcher to evaluate not only the entire model but also the measures that underlie the constructs.

As a first step, CFA was used to create and test models, called one-factor congeneric models, for each of the constructs, showing what items gave the best fit, using the AMOS version 24 software package. Initially the one-factor congeneric model for any given construct made use of all the items in it. Any items with standardised regression weights below 0.298, a value deemed by Field (2000) to be the minimum acceptable for retention for a sample size of at least 300 cases, were removed from the model. If a model fit was not obtained after this, items with the lowest standardised regression weight were progressively removed of until a either a good model fit was obtained, or three items were left, the minimum acceptable for a one-factor congeneric model.

If a one-factor congeneric model was unable to obtain a good fit when only three items remained, Principal Components Analysis (PCA) was employed, using the SPSS version 24 software package. PCA is a technique to investigate a dataset for underlying constructs; in this case the PCA was performed using Varimax rotation, which elevates high loading indicating a construct while reducing low ones (Neter, Kutner, Nachtsheim and Wasserman, 1996). To deal with a construct with less than three items, PCA was performed on all the items from all the original constructs, and the construct with the highest factor loadings that featured one or more of the items from the "problem" construct.

As a final test, a Critical Ratio Difference (CRDIFF) test was performed on the items in the construct, to test if it was valid to equate any of them, and thus constrain them in the model. See section 5.3 for the results of one-factor congeneric modelling.

### 4.11 Goodness of Fit Indices

A statistical assessment of the model fit is necessary to evaluate whether there is enough evidence to support the proposed causal relationships. There is a wide array of goodness-of-fit indices that researchers can rely on to evaluate models produced by SEM. This section explores various fit indices that guided the study in the model evaluation. The common indices are discussed together with their interpretive values. This study utilised two of the three categories of fit indices identified by Field (2000) and Hooper (2008): absolute fit indices and relative fit indices.

Absolute Fit Indices are indices that do not rely on base comparisons with alternate models in evaluating a developed model. Therefore, the analysis assumes the model fit benchmark as zero. Therefore, the measures determine how far the model is from zero to assess the model fit. Examples of absolute fit indices are the Likelihood ratio Chi-square test, Goodness of fit Index (GFI), Root mean square error of approximation (RMSEA), the Root mean square residual (RMR), the Standardised root mean square residual (SRMR).

Relative Fit Indices: Relative Fit Indices are indices that rely on base comparisons with alternate models (null model) in evaluating a developed model. The alternate model specifies that all the variables that have been measured are uncorrelated. Therefore, the alternate model always has a large Chi-Square since it is a poor fit. Examples of relative fit indices are Comparative Fit Index (CFI).

Although opinions differ on what threshold value indicates an acceptable fit for goodness of fit indices (Hooper 2008), a broad consensus on what is acceptable is emerging. This study used the guidelines described by Field (2000) and Kline (2005) for threshold values, summarised on Table 4.1.

Table 4.1 Summary of Fit Indices

| | **Value Range** | **Acceptable Level** |
|---|---|---|
| ABSOLUTE FIT | | |
| **Likelihood ratio Chi-square ($x^2$)** | Tabled value | Compares with tabled value for given df (CMIN/DF < 5) |
| **GFI** | Ranges from 0 (no fit) to 1 (perfect fit) | Value > 0.90 |
| **RMSEA** | Ranges from 0 (perfect fit) to 1 (no fit). | Best if value is < 0.05; but < 0.08 acceptable |
| **RMR** | Ranges from 0 (perfect fit) to 1 (no fit). | As close to zero as possible |
| **SRMR** | Ranges from 0 (perfect fit) to 1 (no fit). | Value < 0.1 |
| Relative Fit Indices or COMPARATIVE FIT INDICES | | |
| **CFI** | Ranges from 0 (no fit) to 1 (perfect fit) | Value > 0.90 |

Source**:** Brown 2006; Field 2000; Corder and Foreman 2014; Kline 2005; Nawi 2012; Schrieber et al**.** 2006

These goodness of fit indices were generated for the one factor congeneric models for each of the constructs using the AMOS Version 24 software package and used to their fit (see Section 5.3 for results). Later, these indices would also be generated for the measurement model and the structural models for the Extended UTAUT and Adapted Original UTAUT using the

AMOS Version 24 software package and used to test their fit in the same way (see Section 4.14 for description, see Sections 5.5, 5.6, 5.7 and 5.8 for results).

## 4.12 Construct Validity

Construct validity measures the accuracy of the measurement items in the model. Evidence of construct validity suggests that the item measures accurately represent the intended concept and the survey data actually measures what it is intended to measure. This study measured convergent validity, construct reliability and discriminant validity to determine the construct validity of the one-factor congeneric models for each of the constructs.

### 4.12.1 Convergent Validity

Convergent validity is a measure of how consistent the items are in contributing to the construct. This was measured using factor loading and with Average Variance Extracted.

#### *4.12.1.1 Factor Loading*

One of the most easily obtainable measures of convergent validity is the factor loading measures of the model itself. A factor loading for a variable is a measure of how much the variable contributes to the factor; thus, high factor loading scores indicate that the dimensions of the factors are better accounted for by the variables. Hair et al. (2010)suggests that homogeneous estimates that have been loaded have to be between 0.5 and 0.7. In this study, the acceptable limits for factor loading were set at 0.5 or above. Factor loading for each of the items was examined for the one-factor congeneric models for each of the constructs to indicate their convergent validity (see Section 5.4.1 for results).

#### *4.12.1.2 Average Variance Extracted*

The Average Variance Extracted (AVE) is a more readily accessible measure of convergent validity. It is generated by the formula by the formula below (Fornell and Larcker, 1981).

$$VE = \frac{\sum_{i=1}^{n} \lambda_i^2}{n}$$

Where:
*Li*= standardised factor loading
*i*=number of items
n= items

It is generally accepted that AVE must be above 0.5 to be considered acceptable. This will indicate that each of its items by itself is a good measure for the construct, that all its items are expected to load highly on the construct and correlate with each other**.** In this study, AVE was generated for the one factor congeneric models of each of the constructs using the AMOS Version 24 software package to measure their convergent validity **(**see Section 5**.**4**.**1 for results**).**

### 4.12.2 Construct Reliability

Construct reliability is a measurement of the relatedness of the items in a construct, or how internally consistent the construct is. A commonly used measure of construct reliability is Cronbach's alpha value (α), generated by the formula below:

$$\alpha = \frac{N \cdot \bar{c}}{\bar{v} + (N-1) \cdot \bar{c}}$$

Where:
N = number of items
c-bar = average inter-item covariance among the items
v-bar = average variance

Pallant (2013) recommends an α of greater than 0.7 is for a construct to be considered reliable. In this study, α was calculated for each of the constructs using with the AMOS version 24 software package to measure their construct reliability (see Section 5.4.1 for results).

### 4.12.3 Discriminant Validity Testing

Discriminant validity analysis refers to testing statistically if two constructs are distinct, and that they are not measurement of a single construct. In this study, the structural equation modelling technique suggested by Bagozzi et al. (1991) is used for this test. In this procedure, discriminant validity of pairs of the factors is tested by constraining the correlation between two constructs to 1.00 (constrained model) and the results are then compared against those of the model where the correlation is freely estimated (unconstrained model). If the *p*-value shows a significant difference between the constrained model and unconstrained model, discriminant validity has been observed. This procedure was performed using the AMOS version 24 software package (see Section 5.4.2 for results).

## 4.13 Full Measurement Analysis and Structural Modelling

CFA was used again to incorporate all of the constructs into a single model using the AMOS version 24 software package. First, measurement modelling was performed on the independent variable constructs; linking each of them together in single model. In order to obtain a better fit, this measurement model was linked to the two dependent variable constructs, and linkages with a low-factor loading progressively removed until a good fit was achieved. This entire process was repeated twice, first on the Extended UTAUT model (see Sections 5.5 and 5.6 for results) and later on the Adapted Original UTAUT model (see Sections 5.7 and 5.8 for results). Goodness of fit indices (see Section 4.12) were used to check the fit of both measurement and structural models (see Sections 5.5, 5.6, 5.7 and 5.8 for results).

## 4.14 Multicollinearity Testing

Multicollinearity is correlations or multiple correlations of sufficient magnitude between independent variables to have the potential to adversely affect regression estimates. This study tested for multicollinearity by examination of correlation estimates and by the Variance Inflation Factor (VIF). Correlation estimates between constructs at 0.90 and above would indicate the presence of multicollinearity (Hair et al. 2010) in the measurement model. In addition to using correlation coefficient to determine the presence of multicollinearity, the researchers also obtained collinearity statistics through SPSS V 24.0. If the Variance Inflation Factor (VIF) in the collinearity statistics is greater than 10, or the Tolerance is less than 0.1, then multicollinearity is an issue in the model. These multicollinearity tests were performed on the Adapted Original UTAUT using the AMOS version 24 software package (see Section 5.7.1 for results).

## 4.15 Path Analysis

The paths of the Adapted Original UTAUT and the Original UTAUT model were compared, using the AMOS version 24 software package (see Section 5.9 for results).

## 4.16 Non-Parametric Testing

Non-parametric tests do not depend on parameterised probability distributions. Therefore, non-parametric tests are useful in circumstances in which the data does not follow a normal distribution and it is not defined by unique population characteristics (mean and standard deviation). This study evaluated the demographic characteristics as intervening variables in the developed UTAUT model.

### 4.16.1 Mann Whitney U Test

The Mann-Whitney U Test allows testing of two mutually exclusive samples that are drawn from a similar target population. In this study, the Mann-Whitney U Test was used to assess the impact of Gender on the predictive factors influencing the adoption of GFMIS. This was done using the AMOS Version 24 software package (see Section 5.11.3 for results).

### 4.16.2 Kruskal Wallis Test

The Kruskal-Wallis Test is another non-parametric test that allows a researcher to test more than two more mutually exclusive samples. This study used Kruskal-Wallis test for assessing the impact of Age and Education Level on on the predictive factors influencing the adoption of GFMIS. This was done using the AMOS Version 24 software package (see Sections 5.11.2 and 5.11.4 for results).

## 4.17 Conclusion

This study sought to determine factors influencing the use of the GFMIS in Thailand's MOAC. Raw data was collected using a questionnaire, in which demographic data (gender, age, and education level) and data relating to the eight independent (Effort Expectancy, Facilitating Conditions, Performance Expectancy, Social Influence, Anxiety, Attitude, Self-Efficacy, and Perceived Credibility) and two dependent (Intention to Use Future Technologies and Use Behaviour) constructs were collected. Data for the latter questions were responses to a series of attitudinal statements using the Likert Scale. 600 copies of this questionnaire were made available to employees of the MOAC, where they were filled in on an entirely voluntary basis. The survey was designed and performed in accordance with standard ethical expectations for social research.

To determine which of the attitudinal statements were representative of their respective constructs, one factor congeneric models were created and tested with Confirmatory Factor Analysis (CFA), using the AMOS version 24 software package. Items with the lowest standardised regression weight were progressively removed of until a either a good model fit was obtained, or three items were left, the minimum acceptable for a one-factor congeneric

model. If a one-factor congeneric model was unable to obtain a good fit when only three items remained, Principal Components Analysis (PCA) was employed, using the SPSS version 24 software package. Goodness of fit was measured using six indices, generated using the AMOS Version 24 software package. A Critical Ratio Difference (CRDIFF) test was also performed on the one factor congeneric models. The construct validity of the one factor congeneric models was then tested for using two convergent validity tests, a construct reliability test and a discriminant validity test.

CFA was used again to incorporate all of the constructs into a single model using the AMOS version 24 software package. First, measurement modelling was performed on the independent variable constructs; linking each of them together in single model. In order to obtain a better fit, this measurement model was linked to the two dependent variable constructs, and linkages with a low-factor loading progressively removed until a good fit was achieved. This process was performed on both the Extended UTAUT model and the the Adapted Original UTAUT model. The six goodness of fit indices were used to measure the fit of all four models. Multicollinearity was tested for using examination of correlation estimates and by the Variance Inflation Factor (VIF). The paths of the Adapted Original UTAUT and the Original UTAUT model were compared, using the AMOS version 24 software package.

The Mann Whitney U Test was used to effect of gender and Kruskal Wallis Tests were determine the effects of age and education level. Both tests used the AMOS Version 24 software package.

# CHAPTER FIVE
# DATA ANALYSIS AND RESULTS

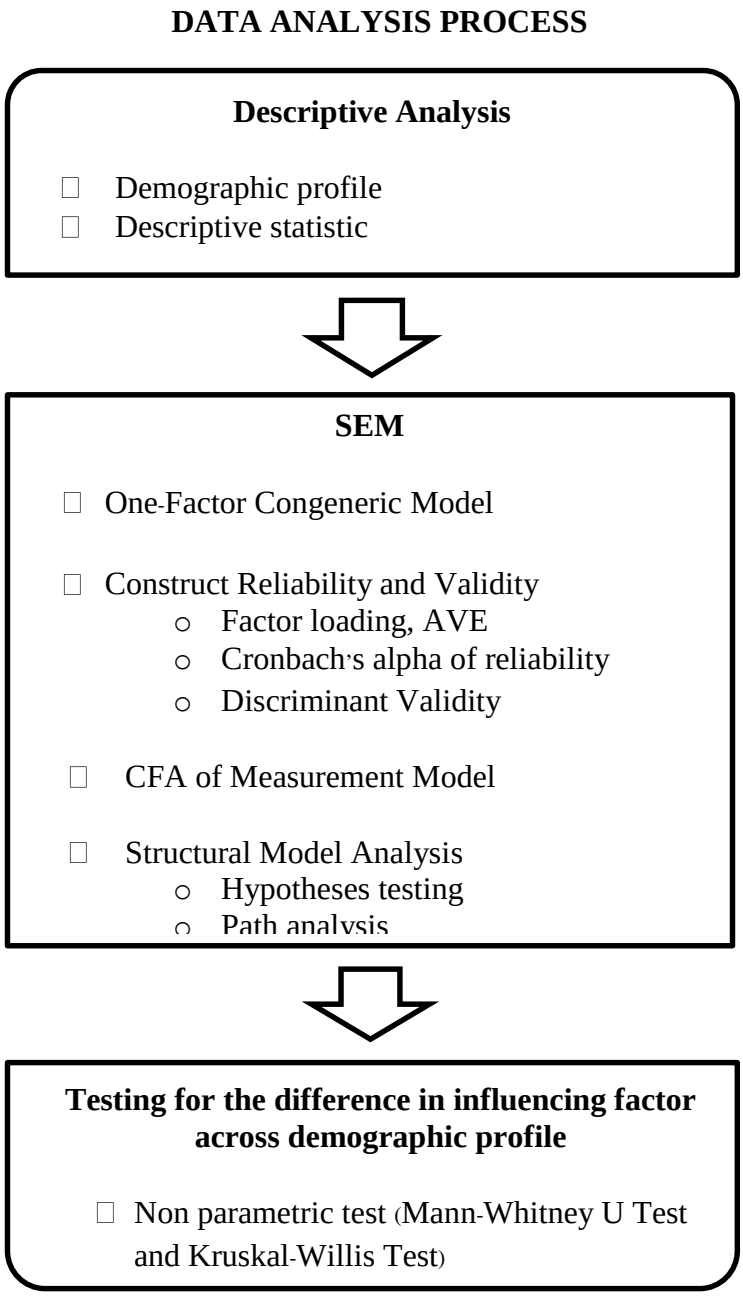
## 5.1 Introduction

This section discusses the analysis of a voluntary survey given to employees of Ministry Of Agriculture and Corporation (MOAC) of Thailand discussing their use of the Government Fiscal Management Information System (GFMIS). In addition to recording the Age, Gender, and Education Level of the respondents, the survey recorded their agreement or disagreement with 80 statements, grouped into ten constructs. The frequency of the demographic factors of the respondents was determined and the descriptive statistics of their responses were generated.

After one-factor congeneric models were generated for each of the constructs, construct validity and discriminant validity tests were performed on each of the constructs to determine their accuracy and distinctness, respectively. All the constructs were combined to form the Extended UTAUT model, but measurement and structural analysis indicated that this model was a poor fit. Therefore a simplified model, using only six of the constructs, was developed. This simplified model was dubbed the Adapted Original UTAUT model, to distinguish it from the very similar Original UTAUT model used by Venkatesh et al. (2003). Measurement and structural analysis showed that this model was a far better fit, while multicollinearity tests determined the distinctness of the constructs used in this model. Path analysis tested the significance of the relationships between the constructs, and showed that there were several differences between Venkatesh's Original UTAUT model and the Extended UTAUT model generated by this study.

Non-parametric tests were then performed to determine if the demographics of the respondents affected their responses. The Mann-Whitney U test was used to determine the effect of age and the Kruskal Wallis Test was used to determine the effect of age and education level. Figure 5.1 summarises the sequential analysis process.

Figure 5.1 Data Analysis Process




## 5.2 Response Rate, Respondents' Characteristics and Descriptive Statistics

### 5.2.1 Respondents and Response Rates

The response rate is the proportion of people in the initial sample who respond to a survey (Punch 2003). A high response rate ensures that the survey results are representative of the targeted population and thus give meaningful results (Punch 2003). Researchers generally recommend that a 50% response rate is a minimum acceptable response rate for social research

(Kidder 1981; Nulty 2008; El-Saharty et al. 2005; Babbie 2010) however Fincham (2008) stated that a response rate in the area of 60% was usually set by researchers. In practice, these percentages are often achievable, (Baruch and Holtom, 2008) performed a meta-study that analysed 175 surveys and 141 published studies and found they achieved a response rate of 55.6% on average. A best practice and technology consulting company reported that for more than 200 surveys conducted globally in 2012, the average return rate was 76% (Buck 2013). However, care must be taken with very high response rates (Buck 2013), for example those exceeding 80% (Fincham 2008). Such unreasonably high responses may indicate an element of coercion in response, which could yield incomplete, ill-considered or maliciously misleading data.

A total of 600 surveys were distributed among employees of Thailand's MOAC. Although 512 of these employees responded (approximately 85% participation), 112 of these (approximately 18.7%) were incomplete, and 85 of those remaining (approximately 14.1%) were subsequently identified using Mahalanobis Distance techniques as being outliers. This left 315 usable cases (52.5%) to be analysed, which is over the generally accepted threshold of 50% (Kidder 1981; Nulty 2008; El-Saharty et al. 2005; Babbie 2010), though below the 60% recommended by Fincham (2008).

Although the survey had obtained information if a respondent was a managerial and operational employee, managerial respondents to the survey were grossly underrepresented, probably reflecting the underlying population of GFMIS users of the MOAC. This underrepresentation was such that it would invalidate subsequent statistical comparison.

### 5.2.2 Characteristics of Respondents

Questions Q3 to Q5 of the survey recorded the demographics of the MOAC employees. The Gender, Age, and Education Level of the original 400 complete responses is summarised on Table 5.1

Table 5.1 Demographic characteristics of respondents

| Demographic | Characteristic | Frequency | Relative Frequency (%) |
|---|---|---|---|
| **Q3 Gender** | Male | 54 | 13.5 |
| | Female | 346 | 86.5 |
| **Q4 Age** | 18 to 24 | 38 | 9.5 |
| | 25 to 34 | 150 | 37.5 |
| | 35 to 44 | 104 | 26.0 |
| | 45 to 54 | 68 | 17.0 |
| | 55 to 64 | 40 | 10.0 |
| **Q5 Education Level** | High School | 23 | 5.8 |
| | College | 74 | 18.5 |
| | Bachelor Degree | 263 | 65.8 |
| | Master Degree | 40 | 10.0 |

Eight times as many women compared to men took part in the study. This "Gender gap" matches the overall trend in Thailand showing women use the internet more than men (UNPAN 2014). Although younger female respondents are over represented in the sample compared to the overall Thai population, 600 of 867 (OCSC, 2017) GFMIS-using employees were randomly sampled by the survey, suggesting that this over-representation is not a statistical artifact.

Employees aged between 25 and 44 are greatly over-represented, 63.5% of responding employees compared to 32% of overall Thai population in 2012 (Population Pyramids of the World 2015), as might be expected from a workplace made up of adults, although this is not the case for employees aged between 45 and 64, 27% of employees the proportion of employees compared to 26.1% of Thai population in 2012 (Population Pyramids of the World 2015). This does go against the overall trend of internet use being uncommon in Thais older than 50 (IMC Institute and ATCI 2014).

This may be explained by the relatively well educated nature of responding employees, with only 5.8% having no tertiary education, and the overwhelming majority having a bachelor degree or better.

### 5.2.3 Descriptive Statistics

Questions Q9 to Q18 of the survey recorded the responses of MOAC employees to a series of questions relating to the GFMIS system. Each of these questions had a series of statements, which the employee responded to using the Likert Scale; numbers from 1 to 7 standing for agreement or disagreement, with 1 indicating strong disagreement with the statement, 7 indicating strong agreement, and 4 being the point of neutrality. Each of the ten questions represented a construct for the Extended UTAUT model, and each of the 80 statements represented an item for one of these constructs. The constructs were: Q9 Use Behaviour, Q10 Performance Expectancy, Q11 Effort Expectancy, Q12 Social Influence, Q13 Facilitating Conditions, Q14 Anxiety, Q15 Self-Efficacy, Q16 Perceived Credibility, Q17 Attitude and Q18 Intention to use Future Technologies.

Descriptive statistics for the responses to the statements are summarised on Table 5.2. The bulk of the questions featured positive statements to the GFMIS, and the mean response to these is generally between 4 and 5, indicating slight support for the system. In contrast, Q14 Anxiety and Q16 Perceived Credibility featured statements that were negative to the GFMIS, and had mean responses ranging from 4 to 3, again indicating slight approval for the GFMIS and suggesting that this approval is considered.

Table 5.2 Means and standard deviations for all variables used in the study

| No.code | Questionnaire item | Mean | SD |
|---|---|---|---|
| | Q9 USE BEHAVIOUR | | |
| q0009_0001 | I use the GFMIS as much as I possibly can. | 5.5125 | 1.21389 |
| q0009_0002 | I am constantly looking for ways to avoid using the GFMIS | 3.1325 | 1.73565 |
| q0009_0003 | It doesn't matter to me whether I use the GFMIS or an alternative (e.g. Excel or manual method). | 3.8175 | 1.78807 |
| q0009_0004 | I prefer to use the GFMIS as compared to the traditional method. | 5.7525 | 1.08821 |
| q0009_0005 | I constantly look to improve my knowledge of the GFMIS (e.g. by exploring new functionality). | 5.8900 | .82741 |
| q0009_0006 | I look forward to the release of promised new, improved GFMIS functionality. | 6.0300 | .84314 |
| | Q10 PERFORMANCE EXPECTANCY | | |
| q0010_0001 | Using the GFMIS in my job enables me to accomplish tasks more quickly. | 5.9525 | .81665 |
| q0010_0002 | Using the GFMIS improves my job performance. | 5.8625 | .77466 |
| q0010_0003 | I would find the GFMIS useful in my job. | 5.9575 | .77278 |
| q0010_0004 | Use of the GFMIS has no effect on the performance of my job. | 5.3675 | 1.40976 |
| q0010_0005 | Use of the GFMIS decreases the time needed for my important job responsibilities. | 5.5475 | 1.04426 |
| q0010_0006 | Use of the GFMIS increases my job effectiveness. | 5.8275 | .79330 |
| q0010_0007 | Using the GFMIS improves the quality of the work I do. | 5.7275 | .86029 |
| q0010_0008 | Using the GFMIS makes it easier to do my job. | 5.7550 | .89273 |
| q0010_0009 | Using the GFMIS increases my productivity. | 5.5475 | .97987 |
| q0010_0010 | If I use the GFMIS my co-workers will perceive me as competent. | 4.9550 | 1.41350 |
| q0010_0011 | If I use the GFMIS I will increase my chances of obtaining a promotion. | 4.3750 | 1.68120 |
| q0010_0012 | If I use the GFMIS I will increase my chances of getting a raise. | 4.4175 | 1.66286 |
| | Q11 EFFORT EXPECTANCY | | |
| q0011_0001 | My interaction with the GFMIS is clear and understandable. | 5.2775 | 1.11292 |
| q0011_0002 | I find the GFMIS to be flexible to interact with. | 4.8000 | 1.30355 |
| q0011_0003 | It is easy for me to become skilful at using the GFMIS. | 5.4925 | 1.14377 |
| q0011_0004 | Overall, I find the GFMIS easy to use. | 5.2300 | 1.17069 |
| q0011_0005 | Using the GFMIS takes too much time from normal duties. | 3.9150 | 1.59817 |
| q0011_0006 | Working with the GFMIS is so complicated, it is difficult to understand what is going on. | 4.0050 | 1.58311 |
| q0011_0007 | It takes so long to learn how to use the GFMIS | 4.7400 | 1.58704 |
| q0011_0008 | I believe that it is easy to get the GFMIS to do what I want it to do. | 5.4775 | 1.09201 |
| q0011_0009 | Learning to operate the GFMIS is easy for me. | 4.8125 | 1.32353 |
| q0011_0010 | Using the GFMIS means I spend less time on routine job tasks. | 4.9475 | 1.34136 |
| | Q12 SOCIAL INFLUENCE | | |
| q0012_0001 | People who influence my behaviour think that I should use the GFMIS. | 5.5225 | 1.05227 |
| q0012_0002 | My supervisor think that I should use the GFMIS. | 5.6275 | .95710 |
| q0012_0003 | I use the GFMIS because of the proportion of my coworkers who use the system. | 4.7325 | 1.63021 |
| q0012_0004 | The senior management of this department has been helpful in the use of the GFMIS. | 5.6075 | 1.03978 |
| q0012_0005 | My supervisor is very supportive of the use of the GFMIS for my job. | 5.7875 | .89406 |
| q0012_0006 | In general, the organisation has supported the use of the GFMIS. | 5.8725 | .79865 |
| q0012_0007 | People in my organisation who use the GFMIS have more prestige than those who do not. | 4.3775 | 1.70654 |
| q0012_0008 | People in my organisation who use the GFMIS have a high profile. | 3.9250 | 1.77122 |
| q0012_0009 | Having access to the GFMIS is a status symbol in my organisation. | 4.5075 | 1.67091 |
| | Q13 FACILITATING CONDITIONS | | |
| q0013_0001 | I have control over using the GFMIS. | 4.8475 | 1.31856 |
| q0013_0002 | I have the resources necessary to use the GFMIS. | 5.4000 | .93659 |
| q0013_0003 | I have the knowledge necessary to use the GFMIS. | 5.3900 | 1.00520 |

| | | | |
|---|---|---|---|
| q0013_0004 | The GFMIS is not compatible with other systems I use. | 4.1375 | 1.58900 |
| q0013_0005 | A specific person (or group) is available for assistance with GFMIS system difficulties. | 5.6175 | 1.00933 |
| q0013_0006 | Using the GFMIS is compatible with all aspects of my work. | 4.8225 | 1.44437 |
| q0013_0007 | I think that using the GFMIS fits well with the way I like to work. | 5.5475 | .97217 |
| q0013_0008 | Using the GFMIS fits with my work style. | 5.6275 | .88922 |
| | Q14 ANXIETY (reversed scale) | | |
| q0014_0001 | I feel apprehensive about using the GFMIS. | 4.4975 | 1.48847 |
| q0014_0002 | It scares me to think that I could lose a lot of information using the GFMIS by hitting the wrong key. | 4.4650 | 1.63568 |
| q0014_0003 | I hesitate to use the GFMIS for fear of making mistakes I cannot correct. | 4.2025 | 1.71430 |
| q0014_0004 | The GFMIS is somewhat intimidating to me. | 4.0175 | 1.66557 |
| q0014_0005 | I am fearful of losing focus on performing my job while trying to use GFMIS | 4.1425 | 1.70130 |
| | Q15 SELF-EFFICACY | | |
| q0015_0001 | I could complete a job or task using GFMIS, if there was no one around to tell me what to do as I go. | 4.9775 | 1.32529 |
| q0015_0002 | I could complete a job or task using GFMIS, if I could call someone for help if I go stuck. | 5.3550 | 1.14335 |
| q0015_0003 | I could complete a job or task using GFMIS, if I had a lot of time to complete the job for which the software was provided. | 5.4575 | 1.05877 |
| q0015_0004 | I could complete a job or task using GFMIS, if I had just the built-in help facility for assistance. | 5.4900 | 1.12163 |
| q0015_0005 | I could complete a job or task using GFMIS, if my co-worker knows how to operate it. | 5.5600 | 1.03153 |
| | Q16 PERCEIVED CREDIBILITY (reversed scale) | | |
| q0016_0001 | I do not think this system should have been implemented. | 3.2250 | 1.81593 |
| q0016_0002 | The GFMIS has not delivered the intended benefit. | 4.8550 | 1.69149 |
| q0016_0003 | This system has limited benefit to offer me. | 3.9375 | 1.66900 |
| q0016_0004 | The system has not contributed to my professional development. | 3.7075 | 1.62127 |
| q0016_0005 | The system thus far has not been delivering on its promised benefits to the employees of the organisation. | 3.7900 | 1.62866 |
| q0016_0006 | This system has put the operation of the organisation at risk. | 3.6750 | 1.61272 |
| | Q17 ATTITUDE | | |
| q0017_0001 | Using the GFMIS is a good idea. | 5.7550 | .75922 |
| q0017_0002 | I dislike the idea of using the GFMIS. | 3.2650 | 1.71672 |
| q0017_0003 | Using the GFMIS is pleasant. | 5.6600 | .80686 |
| q0017_0004 | I find using the GFMIS to be enjoyable. | 5.2400 | 1.14703 |
| q0017_0005 | The GFMIS makes work more interesting. | 5.5150 | .93379 |
| q0017_0006 | Working with the GFMIS is fun. | 5.2200 | 1.11567 |
| q0017_0007 | The GFMIS is okay for some jobs, but not my job. | 4.2225 | 1.69268 |
| q0017_0008 | I like working with the GFMIS | 5.3500 | .98485 |
| q0017_0009 | I look forward to those aspects of my job that require me to use the GFMIS. | 4.7850 | 1.40489 |
| q0017_0010 | Using the GFMIS is frustrating for me. | 3.6900 | 1.72811 |
| q0017_0011 | I rely on GFMIS to do my job. | 5.3650 | 1.07921 |
| q0017_0012 | I get bored quickly when using the GFMIS. | 3.5550 | 1.70859 |
| | Q18 INTENTION TO USE FUTURE TECHNOLOGIES | | |
| q0018_0001 | I intend to use the GFMIS in the next 3 months. | 4.5075 | 1.64521 |
| q0018_0002 | I predict I will use the GFMIS in the next 3 months. | 4.4625 | 1.70466 |
| q0018_0003 | I plan to use the GFMIS in the next 3 months. | 4.5300 | 1.65861 |
| q0018_0004 | I will use planned GFMIS extensions in my operations. | 5.2625 | 1.23791 |
| q0018_0005 | I will use planned GFMIS extensions if I am forced by management. | 4.7775 | 1.43985 |
| q0018_0006 | I will be use the planned GFMIS extensions if they make the system easier to operate. | 5.1875 | 1.33859 |
| q0018_0007 | I will use planned GFMIS extension provided it allows me to complete my job as I've always done it or better. | 5.2550 | 1.23238 |

### 5.3 One-Factor Congeneric Models Analysis

One-factor congeneric modelling is used to determine if there is an affiliation between the underlying hypothesised latent constructs and the observed variable. One-factor congeneric models were developed for each separate construct (Use Behaviour, Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Anxiety, Self-Efficacy, Perceived Credibility, Attitude and Intention to use Future Technologies) and tested to see if each model showed internal correlations among the items (Brown 2006 and Schreiber et al., 2006).

Items were removed from the models if their standardised regression weights were below 0.298, a value deemed by Field (2000) to be the minimum acceptable for retention for a sample size of at least 300 cases. Items with standardised regression values that were narrowly over this threshold value of 0.298 were subsequently eliminated if they were found to prevent a model fit. In Effort Expectancy, Facilitating Conditions, Performance Expectancy, Anxiety, Attitude, Self-Efficacy, Perceived Credibility, and Intention to use Future Technologies, all but three of the items were removed from the model in this way.

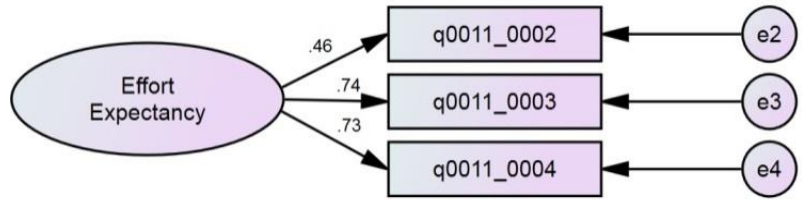
The constructs Social Influence and Use Behaviour were special cases, with all but one of the original items removed from the model. In both cases, Principal Components Analysis (PCA), by generating standardised regression weights for items from all constructs, identified items from Performance Expectancy with standardised regression weights high enough to justify inclusion in these models.

Subsequently Comparative Fit Index (CFI), Goodness of Fit Index (GFI), Root Mean Square Residual (RMR) and Square Root Mean Square Residual (SRMR) were generated for each of the one-factor congeneric models to test their fit. A Critical Ratio Differences (CRDIFF) test was used to determine if any pair of items in the model could be constrained to equality.

### 5.3.1 One-Factor Congeneric Model for Effort Expectancy

Initially the one-factor congeneric model for Effort Expectancy had ten items, however only three items: q0011_0002, q0011_0003 and q0011_0004, were retained. As these three items all had standardised regression weights above 0.4 (>0.295), they all loaded significantly in the construct of Effort Expectancy. Figure 5.2 shows these three items in a one-factor congeneric model for Effort Expectancy.

Figure 5.2 One-factor congeneric model analysis results for Effort Expectancy




q0011_0002: I find the GFMIS to be flexible to interact with.

q0011_0003: It is easy for me to become skilful at using the GFMIS.

q0011_0004: Overall, I find the GFMIS easy to use.

All of the summary of fit measures support a good fit for the model, with chi-squared: CMIN/DF = 0.267, GFI = 1.000, RMSEA = 0.000, RMR = 0.130, SRMR = 0.006 and CFI = 1.000.

The CRDIFF of 0.380 (less than magnitude 1.96) in Table 5.3 indicates that it is valid to equate q0011_0003 (e3) and q0011_0004 (e4).

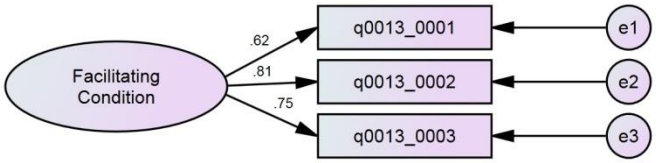
Table 5.3 Critical Ratio of Difference between Parameters (Effort Expectancy)

| | a | b | c | d | e |
|---|---|---|---|---|---|
| a | .000 | | | | |
| b | -2.976 | .000 | | | |
| c | 4.297 | 5.063 | .000 | | |
| d | -2.810 | -.052 | -5.639 | .000 | |
| e | -2.343 | .356 | -5.313 | **.380** | .000 |

### 5.3.2 One-Factor Congeneric Model for Facilitating Conditions

Initially the one-factor congeneric model for Facilitating Conditions had nine items, however, only three of the items: q0013_0001, q0013_0002 and q0013_0003, were retained. As all these items had standardised regression weights above 0.6 (>0.295), they all loaded significantly in the construct of Facilitating Conditions. Figure 5.3 shows the retained three items in a one-factor congeneric model for Facilitating Conditions.

Figure 5.3 One-factor congeneric model analysis results for Facilitating Conditions




q0013_0001: I have control over using the GFMIS

q0013_0002: I have the resources necessary to use the GFMIS.

q0013_0003: I have the knowledge necessary to use the GFMIS.

All of the summary of fit measures support a good fit for the model, with chi-squared: CMIN/DF = 0.001, GFI = 1.000, RMSEA = 0.000, RMR = 0.001, SRMR = 0.000, and CFI = 1.000.

The CRDIFF of 0.901 (less than magnitude 1.96) in Table 5.4 indicates that it is valid to equate q0013_0002 (e2) and q0013_0003 (e3).

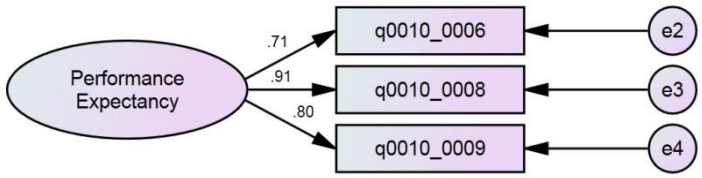
Table 5.4 Critical Ratio of Difference between Parameters (Facilitating Conditions)

| | a | b | c | d | e |
|---|---|---|---|---|---|
| a | .000 | | | | |
| b | **.901** | .000 | | | |
| c | 3.203 | 1.928 | .000 | | |
| d | -7.921 | -7.118 | -7.336 | .000 | |
| e | -5.453 | -4.908 | -6.065 | 2.120 | .000 |

### 5.3.3 One-Factor Congeneric Model for Performance Expectancy

Initially, the one-factor congeneric model for Performance Expectancy had 12 items, however, only three of them: q0010_0006, q0010_0008 and q0010_0009 were retained. As all these items had standardised regression weights above 0.7 (>0.295), they all loaded significantly in the construct of Performance Expectancy. Figure 5.4 shows the retained three items in a one-factor congeneric model for Performance Expectancy.

Figure 5.4 One-factor congeneric model analysis results for Performance Expectancy




q0010_0006: Use of the GFMIS increases my job effectiveness.

q0010_0008: Using the GFMIS makes it easier to do my job.

q0010_0009: Using the GFMIS increases my productivity.

All of the summary of fit measures support a good fit for the model, with chi-squared: CMIN/DF = 2.761, GFI = 1.000, RMR = 0.130, SRMR = 0.006 and CFI = 1.000. RMSEA is borderline at 0.066, but still below higher threshold of 0.08

The CRDIFF of 0.380 (less than magnitude 1.96) in Table 5.5 indicates that it is valid to equate q0010_0008 (e3) and q0010_0009 (e4).

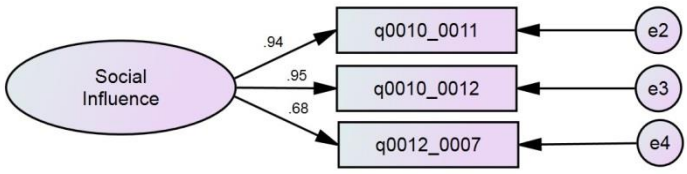
Table 5.5 Critical Ratio of Difference between Parameters (Performance Expectancy)

| | a | b | c | d | e |
|---|---|---|---|---|---|
| a | .000 | | | | |
| b | -6.401 | .000 | | | |
| c | -12.176 | -5.326 | .000 | | |
| d | -14.880 | -10.784 | -4.598 | .000 | |
| e | -9.620 | -4.149 | **1.166** | 4.812 | .000 |

### 5.3.4 One-Factor Congeneric Model for Social Influence

Initially the one-factor congeneric model for Social Influence had nine items, however, only one, q0012_0007 was found to have a standardised regression weight high enough (0.68) to be retained. However, PCA found that items q0010_0011 and q0010_0012 that had been dropped from the one-factor congeneric model for Performance Expectancy were found to be relevant to Social Influence construct, with standardised regression weights of greater than 0.9 (>0.295). All three items loaded significantly in the construct of Social Influence. Figure 5.5 shows these three items in the one-factor congeneric model for Social Influence.

Figure 5.5 One-factor congeneric model analysis results for Social Influence




q0010_0011: If I use the GFMIS I will increase my chances of obtaining a promotion.

q0010_0012: If I use the GFMIS I will increase my chances of getting a raise.

q0012_0007: People in my organisation who use the GFMIS have more prestige than those who do not.

All of the summary of fit measures support a good fit for the model, with chi-squared: CMIN/DF = 0.041, GFI = 1.000, RMSEA = 0.000, RMR = 0.006, SRMR = 0.001 and CFI = 1.000.

With no values less than magnitude 1.96, the CRDIFF of Social Influence construct on Table 5.6 indicates that it is not valid to equate any of the items.

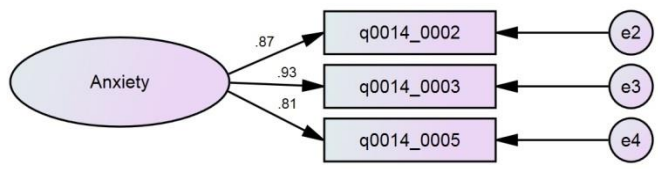
Table 5.6 Critical Ratio of Difference between Parameters (Social Influence)

| | a | b | c | d | e |
|---|---|---|---|---|---|
| a | .000 | | | | |
| b | -6.025 | .000 | | | |
| c | -15.532 | -8.854 | .000 | | |
| d | -16.018 | -9.481 | -.460 | .000 | |
| e | -.026 | 2.889 | 9.609 | 9.897 | .000 |

### 5.3.5 One-Factor Congeneric Model for Anxiety

Initially, the one-factor congeneric model for Performance Expectancy had five items, however, only three items: q0014_0002, q0014_0003 and q0014_0005, were retained. As all these items had standardised regression weights above 0.8 (>0.295), they all loaded significantly in the construct of Anxiety. Figure 5.6 shows these items in the one-factor congeneric model for Anxiety.

Figure 5.6 One-factor congeneric model analysis results for Anxiety




q0014_0002: It scares me to think that I could lose a lot of information using the GFMIS by hitting the wrong key.

q0014_0003: I hesitate to use the GFMIS for fear of making mistakes I cannot correct.

q0014_0005: I am fearful of losing focus on performing my job while trying to use GFMIS

All of the summary of fit measures support a good fit for the model, with chi-squared: CMIN/DF = 1.821, GFI = 0.997, RMSEA = 0.045, RMR = 0.083, SRMR = 0.007 and CFI = 0.997.

With no values less than magnitude 1.96, the CRDIFF of Anxiety construct on Table 5.7 indicates that it is not valid to equate any of the items.

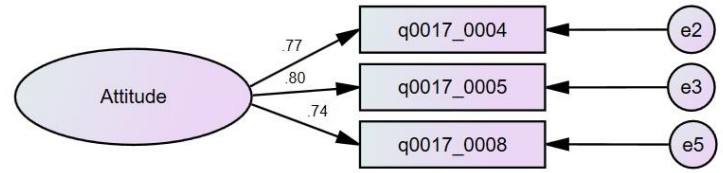
Table 5.7 Critical Ratio of Difference between Parameters (Anxiety)

| | a | b | c | d | e |
|---|---|---|---|---|---|
| a | .000 | | | | |
| b | 3.442 | .000 | | | |
| c | -8.017 | -11.200 | .000 | | |
| d | -11.710 | -10.591 | -1.903 | .000 | |
| e | -2.985 | -4.894 | 4.105 | 5.163 | .000 |

### 5.3.6 One-Factor Congeneric Model for Attitude

Initially, the one-factor congeneric model for Attitude had 11 items, however, from only three items: q0017_0004, q0017_0005 and q0017_0008, were retained. As all these items had standardised regression weights above 0.7 (>0.295), they all loaded significantly in the construct of Attitude. Figure 5.7 shows these items in the one-factor congeneric model for Attitude.

Figure 5.7 One-factor congeneric model analysis results for Attitude




q0017_0004: I find using the GFMIS to be enjoyable.

q0017_0005: The GFMIS makes work more interesting.

q0017_0008: I like working with the GFMIS

Some of the summary of fit measures support a good fit for the model, with, chi-squared: CMIN/DF = 0.916, GFI = 0.998, RMR = 0.020 and CFI = 1.000. The results for RMSEA = 0.000 and SRMR = 0.0085 are the acceptable levels.

With no values less than magnitude 1.96, the CRDIFF of Attitude construct on Table 5.8 indicates that it is not valid to equate any of the items.

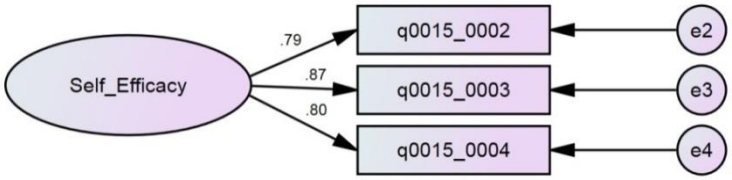
Table 5.8 Critical Ratio of Difference between Parameters (Attitude)

| | a | b | c | d | e |
|---|---|---|---|---|---|
| a | .000 | | | | |
| b | -.346 | .000 | | | |
| c | -2.410 | -2.425 | .000 | | |
| d | -9.592 | -6.341 | -4.068 | .000 | |
| e | -4.966 | -5.710 | -2.369 | 1.996 | .000 |

### 5.3.7 One-Factor Congeneric Model for Self-Efficacy

Initially, the one-factor congeneric model for Self-Efficacy had five items, however, only three items: q0015_0002, q0015_0003 and q0015_0004, were retained. As all these items had standardised regression weights above 0.7 (>0.295), they all loaded significantly in the construct of Efficiency. Figure 5.8 shows these items in the one-factor congeneric model for Self-Efficacy.

Figure 5.8 One-factor congeneric model analysis results for Self-Efficacy




q0015_0002: I could complete a job or task using GFMIS, if I could call someone for help if I go stuck.

q0015_0003: I could complete a job or task using GFMIS, if I had a lot of time to complete the job for which the software was provided.

q0015_0004: I could complete a job or task using GFMIS, if I had just the built-in help facility for assistance.

All of the summary of fit measures support a good fit for the model, with chi-squared: CMIN/DF= 0.007, GFI = 1.000, RMSEA = 0.000, RMR = 0.002, SRMR = 0.001 and CFI = 1.000.

With no values less than magnitude 1.96, the CRDIFF of 0.402 (less than magnitude 1.96) in Table 5.9 indicates that it is valid to equate q0015_0002 (e2) and q0015_0004 (e4).

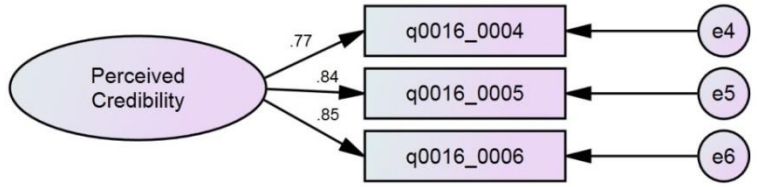
Table 5.9 Critical Ratio of Difference between Parameters (Self-Efficacy)

| | a | b | c | d | e |
|---|---|---|---|---|---|
| a | .000 | | | | |
| b | **.402** | .000 | | | |
| c | -5.916 | -6.856 | .000 | | |
| d | -11.694 | -8.827 | -3.044 | .000 | |
| e | -6.656 | -7.816 | -.664 | 2.471 | .000 |

### 5.3.8 One-Factor Congeneric Model for Perceived Credibility

Initially, the one-factor congeneric model for Perceived Credibility had six items, however, only three items: q0016_0004, q0016_0005 and q0016_0006, were retained. As all these items had standardised regression weights above 0.7 (>0.295), they all loaded significantly in the construct of Perceived Credibility. Figure 5.9 shows these items in the one-factor congeneric model for Perceived Credibility.

Figure 5.9 One-factor congeneric model analysis results for Perceived Credibility




q0016_0004: The system has not contributed to my professional development.

q0016_0005: The system thus far has not been delivering on its promised benefits to the employees of the organisation.

q0016_0006: This system has put the operation of the organisation at risk.

All of the summary of fit measures support a good fit for the model, with chi-squared: CMIN/DF = 0.035, GFI = 1.000, RMSEA = 0.000, RMR = 0.009, SRMR = 0.001 and CFI = 1.000.

With no values less than magnitude 1.96, the CRDIFF of Perceived Credibility construct on Table 5.10 indicates that it is not valid to equate any of the items.

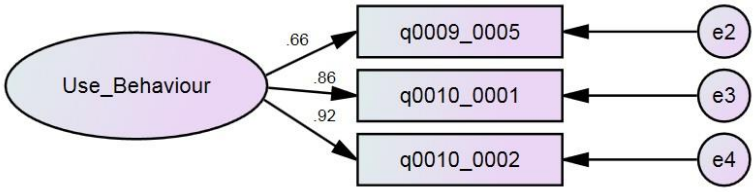
Table 5.10 Critical Ratio of Difference between Parameters (Perceived Credibility)

| | a | b | c | d | e |
|---|---|---|---|---|---|
| a | .000 | | | | |
| b | -1.730 | .000 | | | |
| c | -2.657 | -1.299 | .000 | | |
| d | -5.577 | -4.471 | -2.174 | .000 | |
| e | -5.862 | -4.781 | -2.372 | -2.209 | .000 |

### 5.3.9 One-Factor Congeneric Model for Use Behaviour

Initially, the one-factor congeneric model for Use Behaviour had six items, but only one of these q0009_0005, was found to have a standardised regression weight high enough (0.68) to be retained. However, PCA found that items q00010_0001 and q00010_0002 that were dropped from the one-factor congeneric model for Performance Expectancy are found to be relevant to Use Behaviour construct, with standardised regression weights of greater than 0.8 (>0.295). All items loaded significantly in the construct of Use Behaviour. Figure 5.10 shows these three items in the one-factor congeneric model for Use Behaviour.

Figure 5.10 One-factor congeneric model analysis results for Use Behaviour




q0009_0005: I constantly look to improve my knowledge of the GFMIS (e.g. by exploring new functionality).

q00010_0002: Using the GFMIS improves my job performance.

q00010_0001: Using the GFMIS in my job enables me to accomplish tasks more quickly.

All of the summary of fit measures support a good fit for the model, with chi-squared: CMIN/DF = 0.869, GFI = 0.999, RMSEA = 0.000, RMR = 0.009, and SRMR = 0.006 and CFI = 1.000.

With no values less than magnitude 1.96, the CRDIFF of Use Behaviour on Table 5.11 construct indicates that it is not valid to equate any of the items.

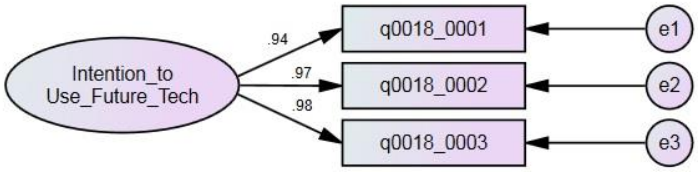
Table 5.11 Critical Ratio of Difference between Parameters (Use Behaviour)

| | a | b | c | d | e |
|---|---|---|---|---|---|
| a | .000 | | | | |
| b | -4.443 | .000 | | | |
| c | -7.758 | -2.944 | .000 | | |
| d | -15.345 | -8.285 | -5.803 | .000 | |
| e | -17.515 | -11.116 | -8.195 | -2.848 | .000 |

### 5.3.10 One-Factor Congeneric Model for Intention to Use Future Technologies

Initially, the one-factor congeneric model for Intention to Use Future Technologies had seven items, however, only three items: q0018_0001, q0018_0002 and q0018_0003, were retained. As all these items had standardised regression weights above 0.7 (>0.295), they all loaded significantly in the construct of Intention to Use Future Technologies. Figure 5.11 shows the retained three items in the one-factor congeneric model for Intention to Use Future Technologies.

Figure 5.11 One-factor congeneric model analysis results for Intention to Use Future Technologies




q0018_0001: I intend to use the GFMIS in the next 3 months.

q0018_0002: I predict I will use the GFMIS in the next 3 months.

q0018_0003: I plan to use the GFMIS in the next 3 months.

All of the summary of fit measures support a good fit for the model, with chi-squared: CMIN/DF = 1.886, GFI = 0.997, RMSEA = 0.047, RMR = 0.036, SRMR = 0.001 and CFI = 0.999.

With no values less than magnitude 1.96, the CRDIFF of Intention to Use Future Technologies construct on Table 5.12 indicates that it is not valid to equate any of the items.

Table 5.12 Critical Ratio of Difference between Parameters (Intention to Use Future Technologies)

| | a | b | c | d | e |
|---|---|---|---|---|---|
| a | .000 | | | | |
| b | -2.985 | .000 | | | |
| c | -20.470 | -18.111 | .000 | | |
| d | -23.915 | -21.657 | -5.016 | .000 | |
| e | -24.736 | -22.690 | -6.287 | -1.555 | .000 |

## 5.4 Assessing Validity of Construct

The accuracy of the items in the constructs, or construct validity, was tested by measuring convergent validity, reliability and discriminant validity.

### 5.4.1 Convergent Validity and Reliability

The accuracy of the items in the constructs, or construct validity, was tested using factor loadings and Average Variance Extracted (AVE) (De Wulf et al. 2001). Factor loadings are one of the commonly used measures for assessing construct validity (Field 2000). Hair et al. (2010) suggests a minimum factor loading value for of 0.5, and ideally 0.7. Average Variance Extracted (AVE) is a summary of the validity of the items in a construct (Hair et al. 2010). A threshold AVE value of 0.5 is accepted as a rule of thumb (Hair et al. 2010).

Reliability, a measurement of the internal consistency of a construct, was also tested through using Cronbach's alpha value (α). Pallant (2013) recommends that an α of greater than 0.7 is considered the threshold for a construct to be considered reliable. The AVE and α of the constructs, and the factor loadings of the constructs items are summarised on Table 5.13 overleaf.

All but one of the items used in the constructs had factor loadings that exceeded the minimum threshold of 0.5, and for the majority of the items the factor loading exceeded the ideal value of 0.7. The one case where the threshold was not met was q0011_0002, part of the Effort Expectancy construct. In all but one of the constructs, both AVE and α exceeded the values of 0.5 and 0.7 respectively. In this exceptional case, Effort Expectancy, the AVE and α were both slightly below them, but the values were deemed sufficiently close to the threshold values to proceed.

Table 5.13 Result of the item reliability for each construct

| **Co**nstruct | **Standardised Estimate Loading** | **Average Variance Extracted (AVE)** | **Cronbach's alpha value (α)** |
|---|---|---|---|
| Effort Expectancy | | | |
| q0011_0002 | 0.464 | | |
| q0011_0003 | 0.738 | 0.432 | 0.665 |
| q0011_0004 | 0.727 | | |
| Facilitating Conditions | | | |
| q0013_0001 | 0.622 | | |
| q0013_0002 | 0.810 | 0.534 | 0.751 |
| q0013_0003 | 0.754 | | |
| Performance Expectancy | | | |
| q0010_0006 | 0.713 | | |
| q0010_0008 | 0.914 | 0.659 | 0.842 |
| q0010_0009 | 0.803 | | |
| Social Influence | | | |
| q0010_0011 | 0.939 | | |
| q0010_0012 | 0.678 | 0.664 | 0.886 |
| q0012_0007 | 0.947 | | |
| Anxiety | | | |
| q0014_0002 | 0.873 | | |
| q0014_0003 | 0.933 | 0.759 | 0.901 |
| q0014_0005 | 0.806 | | |
| Attitude | | | |
| q0017_0004 | 0.770 | | |
| q0017_0005 | 0.798 | 0.589 | 0.806 |
| q0017_0008 | 0.738 | | |
| Self-Efficacy | | | |
| q0015_0002 | 0.787 | | |
| q0015_0003 | 0.867 | 0.671 | 0.857 |
| q0015_0004 | 0.800 | | |
| Perceived Credibility | | | |
| q0016_0004 | 0.770 | | |
| q0016_0005 | 0.842 | 0.672 | 0.860 |
| q0016_0006 | 0.847 | | |
| Use Behaviour | | | |
| q0009_0005 | 0.656 | | |
| q0010_0001 | 0.857 | 0.674 | 0.845 |
| q0010_0002 | 0.919 | | |
| Intention to Use Future Technologies | | | |
| q0018_0001 | 0.940 | | |
| q0018_0002 | 0.970 | 0.928 | 0.976 |
| q0018_0003 | 0.980 | | |

### 5.4.2 Discriminant Validity

Another test, discriminant validity, was conducted to test the distinctness of the constructs. Table 5.14 shows the results of the discriminant validity tests using the structural equation modelling technique suggested by Bagozzi et al. (1991), conducted in a series of pairwise comparisons of constructs. Given that *p*-value indicated a significant difference between all the pairs of constructs and constrained model pair, discriminant validity holds for all these pairwise relationships.

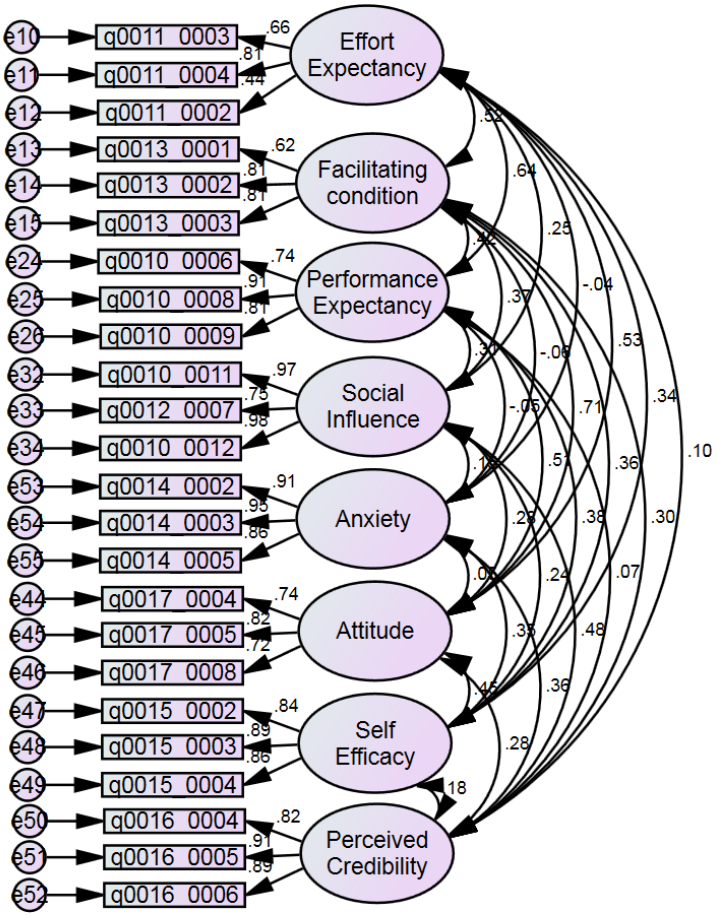
Table 5.14 A summary of discriminant validity result for UTAUT in the measurement model

| **Correlation between a pair of constructs:** | ***p*-value** | **Constrained Model** | **Results** |
|---|---|---|---|
| Effort Expectancy & Facilitating Conditions | 0 | Significantly worsen | Discriminant validity holds |
| Effort Expectancy & Performance Expectancy | 0 | Significantly worsen | Discriminant validity holds |
| Effort Expectancy & Social Influence | 0 | Significantly worsen | Discriminant validity holds |
| Effort Expectancy & Anxiety | 0 | Significantly worsen | Discriminant validity holds |
| Effort Expectancy & Attitude | 0 | Significantly worsen | Discriminant validity holds |
| Effort Expectancy & Self-Efficacy | 0 | Significantly worsen | Discriminant validity holds |
| Effort Expectancy & Perceived Credibility | 0 | Significantly worsen | Discriminant validity holds |
| Performance Expectancy & Facilitating Conditions | 0 | Significantly worsen | Discriminant validity holds |
| Performance Expectancy & Social Influence | 0 | Significantly worsen | Discriminant validity holds |
| Performance Expectancy & Anxiety | 0 | Significantly worsen | Discriminant validity holds |
| Performance Expectancy & Attitude | 0 | Significantly worsen | Discriminant validity holds |
| Performance Expectancy & Self-Efficacy | 0 | Significantly worsen | Discriminant validity holds |
| Performance Expectancy & Perceived Credibility | 0 | Significantly worsen | Discriminant validity holds |
| Social Influence & Anxiety | 0 | Significantly worsen | Discriminant validity holds |
| Social Influence & Attitude | 0 | Significantly worsen | Discriminant validity holds |
| Social Influence & Self-Efficacy | 0 | Significantly worsen | Discriminant validity holds |
| Social Influence & Perceived Credibility | 0 | Significantly worsen | Discriminant validity holds |
| Anxiety & Attitude | 0 | Significantly worsen | Discriminant validity holds |
| Anxiety & Self-Efficacy | 0 | Significantly worsen | Discriminant validity holds |
| Anxiety & Perceived Credibility | 0 | Significantly worsen | Discriminant validity holds |
| Self-Efficacy & Perceived Credibility | 0 | Significantly worsen | Discriminant validity holds |

### 5.5 Full Measurement Analysis of the Extended UTAUT model

After the constructs in the hypothesised model were individually tested using a one-factor congeneric model, and their validity measured, the next step was to integrate these constructs into a full Confirmatory Factor Analysis (CFA) measurement model. The Extended UTAUT model, formed from the eight constructs established through the one-factor congeneric modelling process - Effort Expectancy, Facilitating Conditions, Performance Expectancy, Social Influence, Anxiety, Attitude, Self-Efficacy, and Perceived Credibility, is shown in Figure 5.12.

Figure 5.12 CFA Model for Extended UTAUT Model

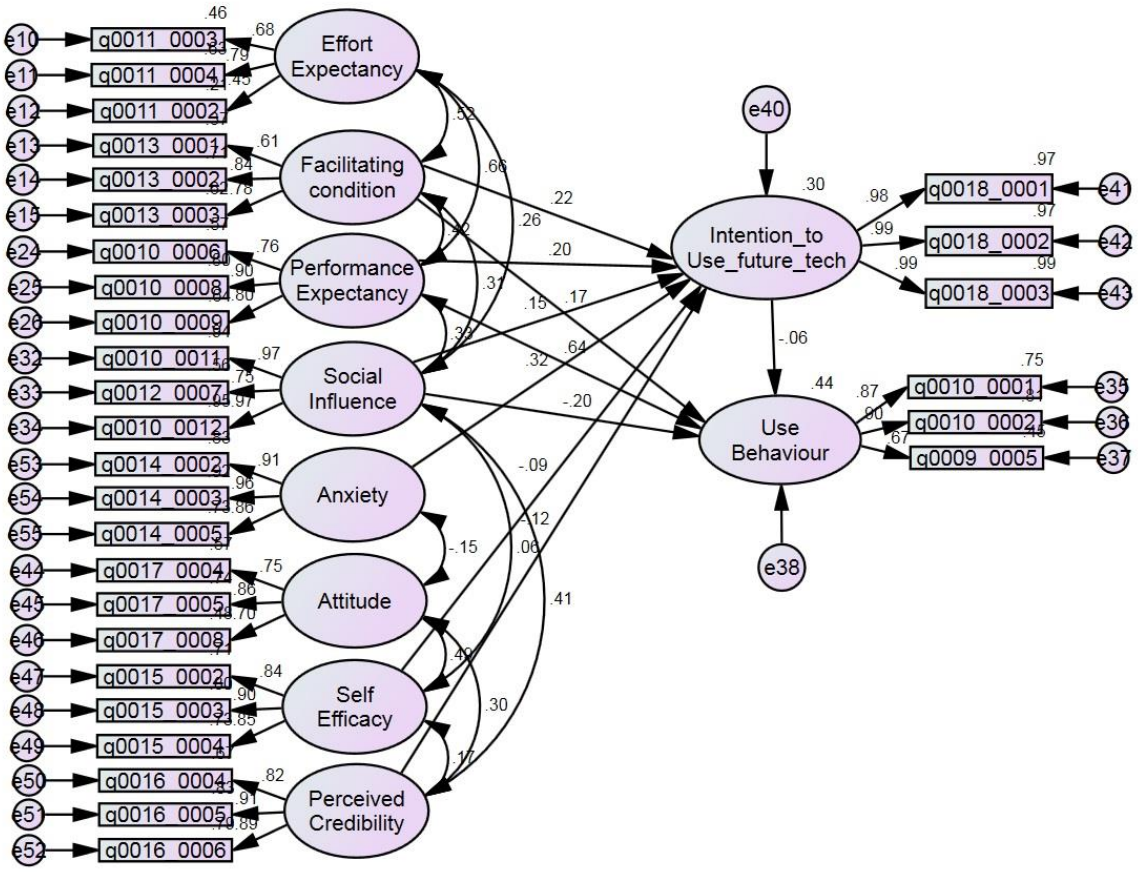



Although some of the indices for goodness of fit were within acceptable levels (CMIN/DF = 2.286, RMR= 0.105, SRMR= 0.053 and CFI= 0.936), RMSEA was borderline but still acceptable at 0.06 and GFI= 0.897 was outside acceptable levels, indicating a poor model fit.

## 5.6 Structural Model Analysis of the Extended UTAUT model

To determine how the constructs interacted with one another, structural modelling analysis was conducted on the Extended UTAUT model. The result of this analysis, showing the significant paths between the constructs, is shown on Figure 5.13.

Figure 5.13 Full Structural for the Extended UTAUT Model

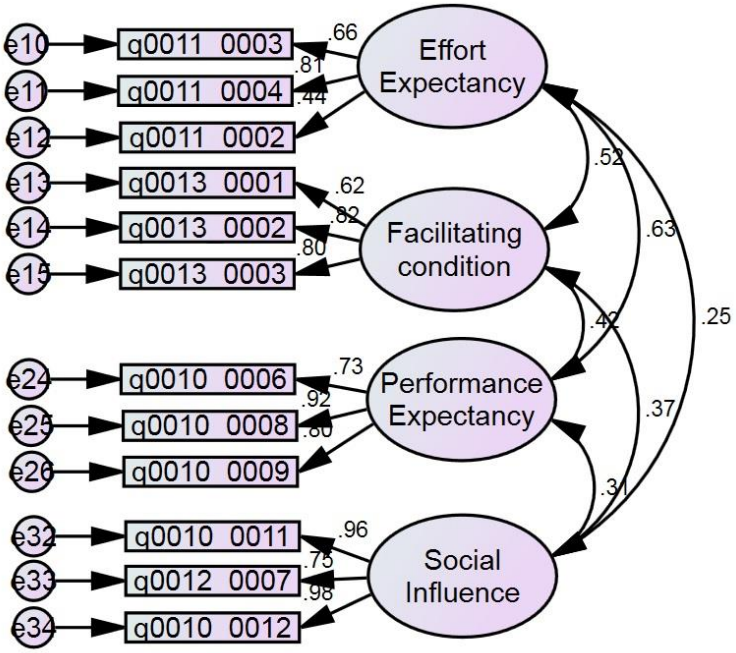



Despite the removal of 85 of the 400 cases identified using Mahalanobis Distance techniques as being outliers (higher than 0.05, this removal was retained for all subsequent analysis), the hypothesised structural model is, if anything, an even poorer fit than the CFA measurement model, with only CMIN/DF = 2.687 and CFI = 0.916 being within acceptable levels, RMSEA = 0.073 being even closer to outside acceptable levels and all other the indices for goodness of fit being outside acceptable levels (GFI = 0.834, RMR = 0.226, SRMR = 0.1612).

## 5.7 Full Measurement Model Analysis of the Adapted Original UTAUT model

In the full structural model of the Extended UTAUT (see Figure 5.13), all of the additional factors had no direct relationship with use behavior, while three of the four from the Original UTAUT had such a relationship. In light of this, combined with the inability to obtain a good fit with all eight independent variables, the decision was made to test a new model to attempt to gain a better fit. This model eliminates the constructs Anxiety, Attitude, Self-Efficacy, and Perceived Credibility, leaving only Effort Expectancy, Facilitating Conditions, Performance Expectancy, and Social Influence, in a model similar to that originally used by Venkatesh et al. (2003). The measurement analysis of this Adapted Original Model is shown in Figure 5.14.

Figure 5.14 Measurement Structure for the Adapted Original UTAUT Model




It is clear that this simplified model is a far better fit than the previous two. Most of the fit indices are well within acceptable levels, indicating a good model fit (CMIN/DF = 2.726, GFI= 0.937, RMR= 0.099, SRMR= 0.059 and CFI= 0.96), although RMSEA= 0.074 is borderline, but acceptable.

### 5.7.1 Multicollinearity Testing of the Adapted Original UTAUT Measurement Model

The multicollinearity was evaluated for this measurement model in order to confirm that the four constructs in the Original UTAUT model were unique and empirically distinguishable. Multicollinearity is correlations or multiple correlations of sufficient magnitude to have the potential to adversely affect regression estimates. Correlation estimates between constructs at 0.90 and above would indicate the presence of multicollinearity (Hair et al. 2010) in the measurement model. As shown in Figure 5.15, the highest correlation coefficient between these pairs of constructs is 0.63, well below this threshold.

In addition to using correlation coefficients to test for the presence of multicollinearity, collinearity statistics were derived using the SPSS V 24.0 package. If the Variance Inflation Factor (VIF) is greater than 10, or the Tolerance is less than 0.1, then multicollinearity is an issue in the model. The collinearity statistics results for the Adapted Original UTAUT measurement model shown in Table 5.15 do not have any such indicators of multicollinearity.

Table 5.15 Collinearity Statistics Result

| **Effort Expectancy Coefficients** | | |
|---|---|---|
| Dependent Variable: | Collinearity Statistics | |
| **Q0011_0003 It is easy for me to become skilful at using the GFMIS.** | Tolerance | VIF |
| Q0011_0004 Overall, I find the GFMIS easy to use. | .982 | 1.019 |
| Q0011_0002 Using the GFMIS takes too much time from normal duties. | .982 | 1.019 |
| | | |
| Dependent Variable: | Collinearity Statistics | |
| **Q0011_0004 Overall, I find the GFMIS easy to use.** | Tolerance | VIF |
| Q0011_0002 Using the GFMIS takes too much time from normal duties. | .979 | 1.022 |
| Q0011_0003 It is easy for me to become skilful at using the GFMIS. | .979 | 1.022 |
| | | |
| Dependent Variable: | Collinearity Statistics | |
| **Q0011_0002 Using the GFMIS takes too much time from normal duties.** | Tolerance | VIF |
| Q0011_0003 It is easy for me to become skilful at using the GFMIS. | .690 | 1.450 |
| Q0011_0004 Overall, I find the GFMIS easy to use. | .690 | 1.450 |

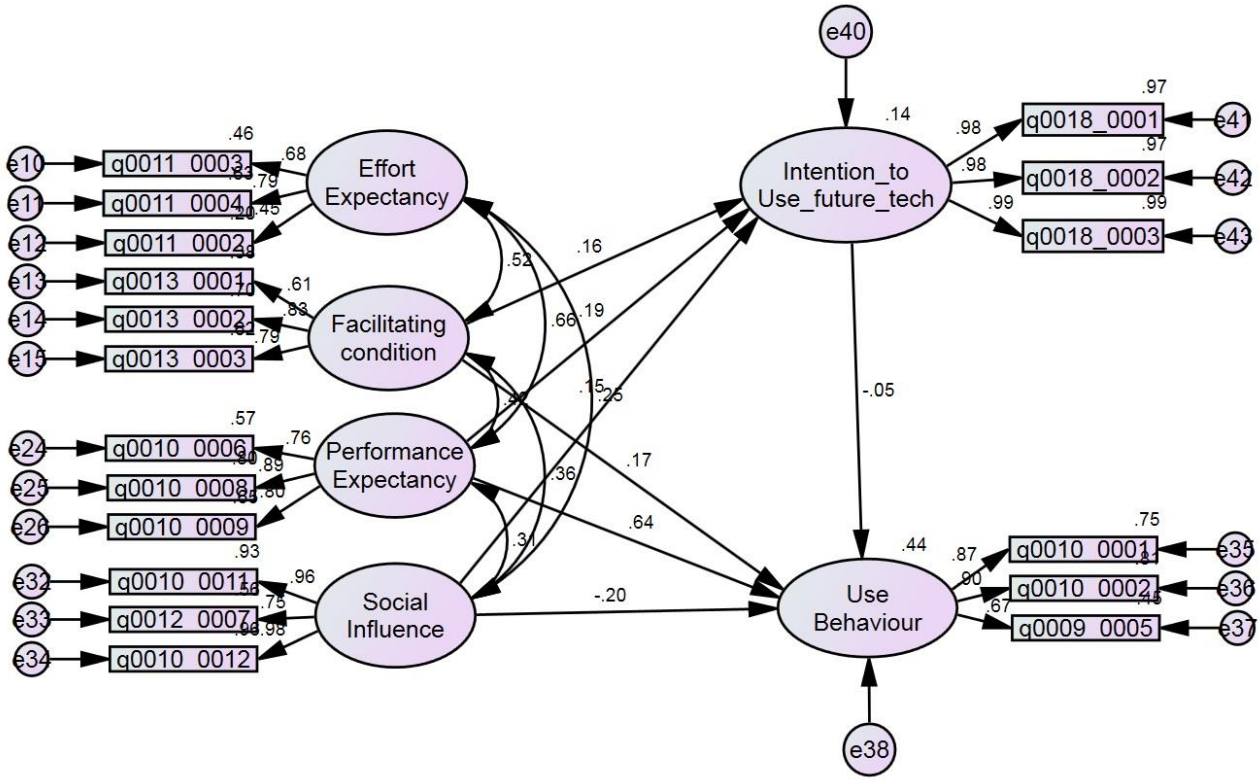
Table 5.15 Collinearity Statistics Result **(**continued**)**

| **Facilitating Condition Coefficients** | | |
|---|---|---|
| Dependent Variable: | Collinearity Statistics | |
| **Q0013_0001 I have control over using the GFMIS** | Tolerance | VIF |
| Q0013_0002 I have the resources necessary to use the GFMIS. | .558 | 1.792 |
| Q0013_0003 I have the knowledge necessary to use the GFMIS. | .558 | 1.792 |
| | | |
| Dependent Variable: | Collinearity Statistics | |
| **Q0013_0002 I have the resources necessary to use the GFMIS.** | Tolerance | VIF |
| Q0013_0003 I have the knowledge necessary to use the GFMIS. | .774 | 1.291 |
| Q0013_0001 I have control over using the GFMIS | .774 | 1.291 |
| | | |
| Dependent Variable: | Collinearity Statistics | |
| **Q0013_0003 I have the knowledge necessary to use the GFMIS.** | Tolerance | VIF |
| Q0013_0001 I have control over using the GFMIS | .746 | 1.341 |
| Q0013_0002 I have the resources necessary to use the GFMIS. | .746 | 1.341 |
| | | |
| **Performance Expectancy Coefficients** | | |
| Dependent Variable: **Q0010_0006 Use of the GFMIS increases my job effectiveness** | Collinearity Statistics | |
| | Tolerance | VIF |
| Q0010_0008 Using the GFMIS makes it easier to do my job | .461 | 2.167 |
| Q0010_0009 Using the GFMIS increases my productivity | .461 | 2.167 |
| | | |
| Dependent Variable: **Q0010_0008 Using the GFMIS makes it easier to do my job** | Collinearity Statistics | |
| | Tolerance | VIF |
| Q0010_0009 Using the GFMIS increases my productivity | .677 | 1.477 |
| Q0010_0006 Use of the GFMIS increases my job effectiveness | .677 | 1.477 |
| | | |
| Dependent Variable: **Q0010_0009 Using the GFMIS increases my productivity** | Collinearity Statistics | |
| | Tolerance | VIF |
| Q0010_0006 Use of the GFMIS increases my job effectiveness | .534 | 1.872 |
| Q0010_0008 Using the GFMIS makes it easier to do my job . | .534 | 1.872 |
| | | |
| **Social Influence Coefficients** | | |
| Dependent Variable: **Q0010_0011 If I use the GFMIS I will increase my chances of obtaining a promotion.** | Collinearity Statistics | |
| | Tolerance | VIF |
| Q0010_0012 If I use the GFMIS I will increase my chances of getting a raise. | 0.462 | 2.163 |
| Q0012_0007 People in my organisation who use the GFMIS have more prestige than who do not. | 0.462 | 2.163 |
| Dependent Variable: **Q0010_0012 If I use the GFMIS I will increase my chances of getting a raise.** | Collinearity Statistics | |
| | Tolerance | VIF |
| Q0010_0011 If I use the GFMIS I will increase my chances of obtaining a promotion. | .482 | 2.073 |
| Q0012_0007 People in my organisation who use the GFMIS have more prestige than who do not. | .482 | 2.073 |
| Dependent Variable: **Q0012_0007 People in my organisation who use the GFMIS have more prestige than who do not** | Collinearity Statistics | |
| | Tolerance | VIF |
| Q0010_0011 If I use the GFMIS I will increase my chances of obtaining a promotion. | 0.111 | 8.980 |
| Q0010_0012 If I use the GFMIS I will increase my chances of getting a raise. | 0.111 | 8.980 |

## 5.8 Structural Model Analysis of the Adapted Original UTAUT model

Structural modelling analysis was conducted on the Adapted Original Model. The result of this analysis, combining the four-construct measurement model with two one-factor congeneric models: Intention to Use Future Technologies and Use Behaviour, is shown on Figure 5.15

Figure 5.15 Full Structural Model for the Adapted Original UTAUT Model




This structural model has a goodness of fit that is comparable to the measurement model, with five of the six indices (CMIN/DF = 2.687, GFI = 0.913, RMR = 0.075, SRMR = 0.054, CFI = 0.969) indicating a good fit, and RMSEA once again being borderline but acceptable at 0.062. Given the superior fit of the Adapted Original UTAUT Model over the Extended UTAUT Model, at least in the Thai government department examined in this study, all subsequent analysis was performed on Adapted Original UTAUT Model.

## 5.9 Structural Paths and Hypotheses

### 5.9.1 Structural Paths Modifications

Although the Adapted Original UTAUT model is superficially very similar to that developed by Venkatesh et al. (2003), there are a number of differences in pathways, as Table 5.16 summarises.

Table 5.16 Comparison between the Original UTAUT model developed by Venkatesh et al. (2003) and adapted model in this study

| | **Original UTAUT model developed by Venkatesh et al. (2003)** | **Adapted Original UTAUT model in this study** |
|---|---|---|
| Effort Expectancy | Behavioural Intention | No path to Behavioural Intention |
| Facilitating Conditions | Use Behaviour | □Intention to Use Future Technologies<br>□Use Behaviour |
| Performance Expectancy | Behavioural Intention | □Intention to Use Future Technologies<br>□Use Behaviour |
| Social Influence | Behavioural Intention | □Intention to Use Future Technologies<br>□Use Behaviour |
| Behavourial Intention/Intention to Use Future Technologies | Use Behaviour | □Use Behaviour |

In the Original UTAUT model Performance Expectancy, Effort Expectancy and Social Influence each have a direct causal path to Behavioural Intention alone. In contrast, in the Adapted Original UTAUT model, Effort Expectancy has no direct causal path to the analogue of Behavioural Intention used in this study, Intention to Use Future Technologies, while Performance Expectancy and Social Influence have causal paths to both Intention to Use Future Technologies and Use Behaviour. In addition, in the Adapted Original UTAUT model, Facilitating Conditions has a similar link to both Intention to Use Future Technologies and Use Behaviour, while in the Original UTAUT model this construct only has a causal relationship with Use Behaviour.

### 5.9.2 Structural Paths and Hypotheses

Of the nine alternative hypotheses proposed in Chapter 3 for the Extended UTAUT model that was found to have no model fit, four of the aforementioned hypotheses (H2, H3, H4 and H9) are relevant to the Adapted Original UTAUT model that was found to have adequate model fit in this study. In addition to reporting the results from the testing of these four hypotheses, new paths that arose from the modifications made to the Original UTAUT Model (identified in Table 5.17) are also evaluated in this section. The results from the testing of hypotheses H2, H3, H4 and H9 and new causal paths in the Adapted Original UTAUT model are presented in Table 5.17 below.

The results for the structural path analysis presented in Table 5.17 indicate that the Adapted Original UTAUT model contains seven structural paths. Of these, six of the seven paths are statistically significant. They are (H2) Facilitating Conditions→Use Behaviour ($p$<0.01); (H3) Performance Expectancy→Use Behaviour ($p$<0.01); (H4) Social Influence→Use Behaviour ($p$<0.01); (New path) Facilitating Conditions→Intention to Use Future Technologies ($p$<0.05); (New path) Performance Expectancy→Intention to Use Future Technologies ($p$<0.01); and (New path) Social Influence→Intention to Use Future Technologies ($p$<0.05).

The data in this study supports H2 in the Adapted Original UTAUT model in which Facilitating Conditions has a statistically significant positive effect on the Use Behaviour GFMIS in MOAC. It also supports H3 in which Performance Expectancy has a statistically significant positive effect on the Use Behaviour of GFMIS in MOAC. Although Social Influence has a statistically significant impact on the Use Behavior of GFMIS in MOAC, it is a negative impact (-0.086) instead of a positive one – hence H4 is not supported in this study. This study however finds Intention to Use Future Technologies does not have a significant positive impact on Use Behaviour of GFMIS in MOAC, hence H9 is not supported in this study.

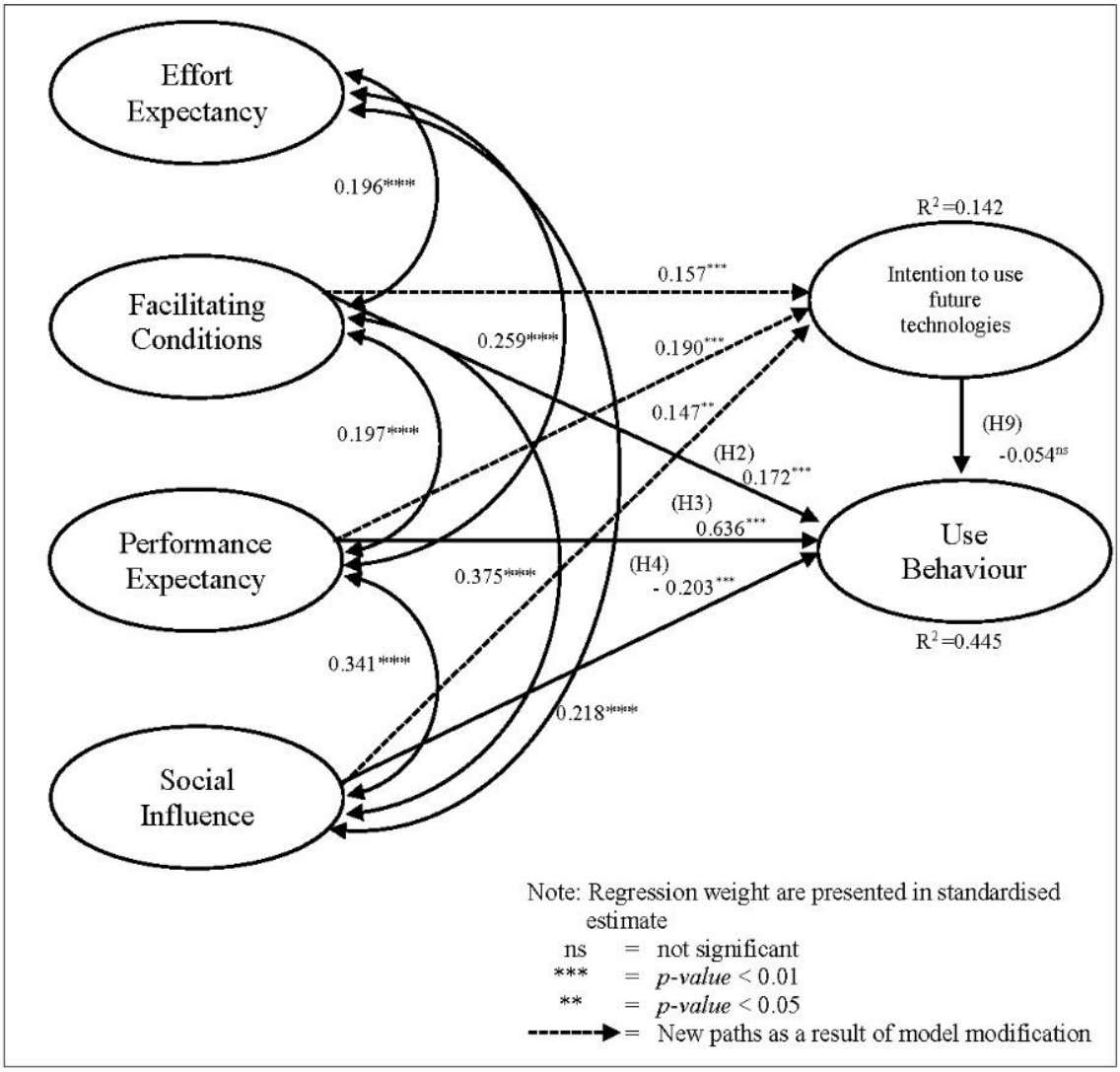
Table 5.17 Results of structural path analysis

| Hypothesis Number/ New Paths | Hypothesis | Structural paths | | | Estimate | S.E. | P | Supported |
|---|---|---|---|---|---|---|---|---|
| H2 | Facilitating Conditions has a significant positive effect on the Use Behaviour | Facilitating Conditions | → | Use Behaviour | *** | 0.172 | 0.065 | Yes |
| H3 | Performance Expectancy has a significant positive effect on the Use Behaviour | Performance Expectancy | → | Use Behaviour | *** | 0.600 | 0.066 | Yes |
| H4 | Social Influence has a significant positive effect on the Use Behaviour | Social Influence | → | Use Behaviour | *** | -0.086 | 0.024 | No |
| H9 | Intention to Use Future Technologies has a positive effect on the Use Behaviour | Intention to Use Future Technologies | → | Use Behaviour | n.s. | -0.024 | 0.023 | No |
| New Path | Facilitating Conditions has a significant positive effect on the Use Behaviour | Facilitating Conditions | → | Intention to Use future Technologies | ** | 0.358 | 0.159 | |
| New Path | Performance Expectancy has a significant positive effect on the Use Behaviour | Performance Expectancy | → | Intention to Use future Technologies | *** | 0.409 | 0.142 | |
| New Path | Social Influence has a significant positive effect on the Use Behaviour | Social Influence | → | Intention to Use Future Technologies | ** | 0.142 | 0.058 | |

*Note: N = 315 maximum likelihood estimates; ***p-value is statistically significant at the 0.01 level (two-tailed); **p-value is statistically significant at the 0.05 level (two-tailed); n.s. = not significant.*

### 5.9.3 Structural Paths, Regression Weights and Correlations

Figure 5.16 Result of structural path analysis for the research model and hypotheses testing




The above diagram in Figure 5.16 shows that all the factors explained 45% of the variance in MOAC employees' Use Behaviour toward the adoption of GFMIS and only 14% of variance in MOAC employees' Intention to Use Future Technologies. Notably, Effort Expectancy does not have a direct causal path to Intention to Use Future Technologies in the Adapted Original UTAUT model. Its correlation with Facilitating Conditions (0.196), Performance Expectancy (0.259) and Social Influence (0.218) are below 0.90 which indicates multicollinearity is not a problem in these relationships (Hair et al. 2010). This is consistent with the evaluation of VIF and Tolerance in Section 5.7.1.

For Intention to Use Future Technologies, Performance Expectancy was the factor with the most influence, having the highest regression weight of 0.190, followed by Facilitating Conditions with 0.159, and Social Influence with 0.147. For Use Behaviour, Performance Expectancy was again the factor with the most influence, having the highest regression weight of 0.636, followed by Facilitating Conditions with 0.172, and Social Influence with -0.203. Performance Expectancy therefore is the most important factor influencing both the Intention to Use Future Technologies and Use Behaviour, followed by Facilitating Conditions and Social Influence.

## 5.10 A Summary on the Comparisons between Adapted Original UTAUT Model and Extended UTAUT Model

The proposed Extended UTAUT model involved testing of nine hypotheses (presented in Section 3.4.1 and 3.4.2) on the following constructs: Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Anxiety, Self-Efficacy, Perceived Credibility, Attitude, Intention to Use Future Technologies and Use Behaviour. The model indices in Table 5.18 show there was no model fit for the Extended UTAUT model in this study and therefore testing of these nine hypotheses through this model was discontinued.

Instead, the investigation was extended to the Original UTAUT model, initially testing five hypotheses. However, the modification of the Original UTAUT model based on the context of the GFMIS in MOAC (resulting in the Adapted Original UTAUT model shown in Figure 5.16) rendered one of the five hypotheses untenable; H1 (Effort Expectancy has a significant positive effect on the Use Behaviour of GFMIS in MOAC) became irrelevant in the Adapted Original UTAUT model because there was no direct causal path between Effort Expectancy and Use Behaviour as shown in Figure 5.16. Therefore, the Adapted Original UTAUT model involves the testing of four hypotheses on the following constructs: Facilitating Conditions, Performance Expectancy, Social Influence, Intention to Use Future Technologies and Use Behaviour. The model indices for this Adapted Original UTAUT model (in Table 5.18) show that this model has an adequate model fit. In addition, three new causal paths were detected from this adapted model (identified in Section 5.9.2).

Table 5.18 Comparison between the Adapted Original UTAUT and the Extended UTAUT models

| UTAUT Models | Hypotheses | CMIN/ DF | CFI | GFI | RMR | RMSEA | SRMR | Model fit |
|---|---|---|---|---|---|---|---|---|
| Extended UTAUT Model | H1, H2, H3, H4, H5, H6, H7, H8, H9 | 2.687 | 0.916 | 1.000 | 0.226 | 0.073 | 0.161 | No |
| Adapted Original UTAUT Model | H2, H3, H4, H9 | 2.217 | 0.969 | 0.913 | 0.075 | 0.062 | 0.054 | Yes |

## 5.11 Group Analysis Supporting Each Hypotheses

### 5.11.1 Gender, Age, and Education Level

For multi-group modeling in SEM using AMOS, the minimum sample size for each sub-group recommended by Kline (2005) is 100 respondents. However, the sub-group sample sizes in terms of Age, Gender and Education Level in this study (as shown in Table 5.19) are not sufficient for multi-group modeling in SEM using AMOS. According to Hayes and Kruger (2014), non-parametric tests (such as Wilcoxon rank-sum or Kruskal-Wallis test) can be appropriate for sample sizes as small as 10. As a result, this study used two non-parametric tests for examining the mediating effect of demographic variables on the predictive factors in the Adapted Original UTAUT model.

Table 5.19 Sample Sizes and Statistical Techniques Used for Demographic Variables

| Demographic variables | | | | | | Statistical technique |
|---|---|---|---|---|---|---|
| Gender | Male (n=47) | Female (n=268) | | | | Mann-Whitney test |
| Education Level | High school (n=20) | College/TAFE (n=64) | Bachelor degree (n=201) | Master degree (n=30) | | Kruskal-Wallis test |
| Age group (years old) | 18 to 24 (n=35) | 25 to 34 (n=118) | 35 to 44 (n=85) | 45 to 54 (n=49) | 55 to 64 (n=28) | Kruskal-Wallis test |

The hypotheses associated with these non-parametric tests are presented in Table 5.20 (which also appeared in Chapter 3).

Table 5.20 Hypotheses on the mediating effects of demographic variables

| **Hypothesis** | **Mediator** | **Hypothesis** |
|---|---|---|
| H10 | *Age* | *There is a significant difference in each predictive factor according to the Age group* |
| H11 | *Gender* | *There is a significant difference in each predictive factor according to the Gender* |
| H12 | *Education Level* | *There is a significant difference in each predictive factor according to Education Level* |

### 5.11.2 Analysis of Age as a Meditating Effect

Table 5.21 below shows the Kruskal-Wallis test results for determining whether there is a significant difference in each predictive factor based on Age group.

Table 5.21 Kruskal-Wallis test results of mediating effect of Age on the predictive factors

| | | 18 to 24 | | 25 to 34 | | 35 to 44 | | 45 to 54 | | 55 to 64 | | Kruskal-Wallis test (*p-value*) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Question no. | Effort Expectancy | Sample size | Mean rank | Sample size | Mean rank | Sample size | Mean rank | Sample size | Mean rank | Sample size | Mean rank | *p*-value | significance |
| q0011_0002 | I find the GFMIS to be flexible to interact with. | 35 | 195.714 | 118 | 151.508 | 85 | 158.282 | 49 | 150.633 | 28 | 150.250 | 0.072 | n.s. |
| q0011_0003 | It is easy for me to become skillful at using the GFMIS. | 35 | 166.243 | 118 | 156.805 | 85 | 163.024 | 49 | 145.010 | 28 | 160.214 | 0.748 | n.s. |
| q0011_0004 | Overall, I find the GFMIS easy to use. | 35 | 175.571 | 118 | 158.271 | 85 | 160.129 | 49 | 141.082 | 28 | 158.036 | 0.435 | n.s. |
| | Facilitating Conditions | | | | | | | | | | | | |
| q0013_0001 | I have control over using the GFMIS. | 35 | 206.400 | 118 | 156.703 | 85 | 146.812 | 49 | 145.255 | 28 | 159.232 | **0.010** | ** |
| q0013_0002 | I have the resources necessary to use the GFMIS. | 35 | 185.171 | 118 | 145.572 | 85 | 148.624 | 49 | 167.296 | 28 | 188.607 | **0.020** | ** |
| q0013_0003 | I have the knowledge necessary to use the GFMIS. | 35 | 198.429 | 118 | 153.212 | 85 | 148.312 | 49 | 162.653 | 28 | 148.911 | **0.035** | ** |

****p-value is statistically significant at the 0.01 level (two-tailed); **p-value is statistically significant at the 0.05 level (two-tailed); n.s. = not significant*

Table 5.21 Kruskal-Wallis test results of mediating effect of Age on the predictive factors (continued)

| Question no. | Effort Expectancy | 18 to 24 | | 25 to 34 | | 35 to 44 | | 45 to 54 | | 55 to 64 | | Kruskal-Wallis test | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sample size | Mean rank | Sample size | Mean rank | Sample size | Mean rank | Sample size | Mean rank | Sample size | Mean rank | *p*-value | Significance |
| | Performance Expectancy | | | | | | | | | | | | |
| q0010_0006 | Use of the GFMIS increases my job effectiveness. | 35 | 135.414 | 118 | 154.186 | 85 | 161.071 | 49 | 171.367 | 28 | 169.589 | 0.270 | n.s. |
| q0010_0008 | Using the GFMIS makes it easier to do my job. | 35 | 153.629 | 118 | 151.479 | 85 | 157.859 | 49 | 166.806 | 28 | 175.964 | 0.583 | n.s. |
| q0010_0009 | Using the GFMIS increases my productivity. | 35 | 173.343 | 118 | 147.644 | 85 | 148.194 | 49 | 171.449 | 28 | 188.696 | 0.058 | n.s. |
| | Social Influence | | | | | | | | | | | | |
| q0010_0011 | If I use the GFMIS I will increase my chances of obtaining a promotion. | 35 | 217.386 | 118 | 166.953 | 85 | 139.276 | 49 | 132.439 | 28 | 147.607 | **0.000** | *** |
| q0010_0012 | If I use the GFMIS I will increase my chances of getting a raise. | 35 | 226.529 | 118 | 167.178 | 85 | 140.918 | 49 | 130.337 | 28 | 133.929 | **0.000** | *** |
| q0012_0007 | People in my organisation who use the GFMIS have more prestige than those who do not. | 35 | 232.400 | 118 | 164.161 | 85 | 134.018 | 49 | 132.980 | 28 | 155.625 | **0.000** | *** |

****p-value is statistically significant at the 0.01 level (two-tailed); **p-value is statistically significant at the 0.05 level (two-tailed); n.s. = not significant*

The Kruskal-Wallis test results in Table 5.21 show that there are no significant differences associated with the predictive factors of Effort Expectancy and Performance Expectancy across the groups classified according to respondents' Age. Facilitating Conditions and Social Influence are the predictive factors that significantly differed according to Age groups, with all measurement items demonstrating statistically significant differences of *p*-value being less than 0.05. These suggest that respondents in different Age groups perceived the influence of Facilitating Conditions and Social Influence differently in the Use Behaviour and Intention to Use Future Technologies.

### 5.11.3 Analysis of Gender as a Meditating Effect

Table 5.22 below shows the results of the Mann-Whitney U test for determining whether there is a significant difference in each predictive factor based on Gender.

Table 5.22 Mann-Whitney U test results of the mediating effect of Gender on the predictive factors

| Question no. | | Male Sample size | Female Sample size | Mann-Whitney U Test *p*-value | Significance |
|---|---|---|---|---|---|
| | Effort Expectancy | | | | |
| q0011_0002 | I find the GFMIS to be flexible to interact with. | 47 | 268 | 0.936 | n.s. |
| q0011_0003 | It is easy for me to become skillful at using the GFMIS. | 47 | 268 | 0.218 | n.s. |
| q0011_0004 | Overall, I find the GFMIS easy to use. | 47 | 268 | 0.936 | n.s. |
| | Facilitating Conditions | | | | |
| q0013_0001 | I have control over using the GFMIS. | 47 | 268 | 0.140 | n.s. |
| q0013_0002 | I have the resources necessary to use the GFMIS. | 47 | 268 | 0.861 | n.s. |
| q0013_0003 | I have the knowledge necessary to use the GFMIS. | 47 | 268 | **0.005** | *** |
| | Performance Expectancy | | | | |
| q0010_0006 | Use of the GFMIS increases my job effectiveness. | 47 | 268 | 0.412 | n.s. |
| q0010_0008 | Using the GFMIS makes it easier to do my job. | 47 | 268 | 0.719 | n.s. |
| q0010_0009 | Using the GFMIS increases my productivity. | 47 | 268 | 0.114 | n.s. |
| | Social Influence | | | | |
| q0010_0011 | If I use the GFMIS I will increase my chances of obtaining a promotion. | 47 | 268 | **0.046** | ** |
| q0010_0012 | If I use the GFMIS I will increase my chances of getting a raise. | 47 | 268 | **0.022** | ** |
| q0012_0007 | People in my organisation who use the GFMIS have more prestige than those who do not. | 47 | 268 | **0.014** | ** |

****p-value is statistically significant at the 0.01 level (two-tailed); ** p-value is statistically significant at the 0.05 level (two-tailed); n.s. = not significant*

The *p*-values from the Mann-Whitney U test for measurement of all the items of Social Influence are below 0.05 (see Table 5.22), which indicates that there is a statistically significant difference in Social Influences between males and females. Only one of the three measurement items of Facilitating Conditions shows a significant difference at 0.05, but there is insufficient evidence to conclude that there is a significant difference in the perceptions of Facilitating Conditions between male and female participants. Measurement items associated with Effort Expectancy and Performance Expectancy are insignificant in terms of Gender differences (*p*-values > 0.05). As such, it cannot be stated that there is any significant difference in the perceptions of Effort Expectancy and Performance Expectancy based on Gender.

### 5.11.4 Analysis of Education Level as a Meditating Effect

Table 5.23 shows the results of a Kruskal-Wallis test, testing if there are significant differences in predictive factors based on education level.

Table 5.23 Sample size and Kruskal-Wallis test results of mediating effect of education on the predictive factors

| Question no. | | High School | | College/TAFE | | Bachelor Degree | | Master Degree | | Kruskal-Wallis test | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Sample size | Mean rank | Sample size | Mean rank | Sample size | Mean rank | Sample size | Mean rank | *p*-value | Significance |
| | Effort Expectancy | | | | | | | | | | |
| q0011_0002 | I find the GFMIS to be flexible to interact with. | 20 | 196.100 | 64 | 163.984 | 201 | 154.418 | 30 | 154.418 | 0.121 | n.s |
| q0011_0003 | It is easy for me to become skilful at using the GFMIS. | 20 | 192.100 | 64 | 144.359 | 201 | 157.162 | 30 | 169.983 | 0.119 | n.s. |
| q0011_0004 | Overall, I find the GFMIS easy to use. | 20 | 204.800 | 64 | 162.461 | 201 | 154.488 | 30 | 140.817 | **0.037** | ** |
| | Facilitating Conditions | | | | | | | | | | |
| q0013_0001 | I have control over using the GFMIS. | 20 | 215.675 | 64 | 160.313 | 201 | 152.619 | 30 | 150.667 | **0.020** | ** |
| q0013_0002 | I have the resources necessary to use the GFMIS. | 20 | 232.775 | 64 | 153.297 | 201 | 149.361 | 30 | 176.067 | **0.000** | *** |
| q0013_0003 | I have the knowledge necessary to use the GFMIS. | 20 | 230.925 | 64 | 161.891 | 201 | 151.214 | 30 | 146.550 | **0.001** | *** |
| | Performance Expectancy | | | | | | | | | | |
| q0010_0006 | Use of the GFMIS increases my job effectiveness. | 20 | 168.200 | 64 | 140.070 | 201 | 162.622 | 30 | 158.483 | 0.237 | n.s. |
| q0010_0008 | Using the GFMIS makes it easier to do my job. | 20 | 182.475 | 64 | 137.477 | 201 | 163.104 | 30 | 151.267 | 0.072 | n.s. |
| q0010_0009 | Using the GFMIS increases my productivity. | 20 | 154.125 | 64 | 157.352 | 201 | 159.731 | 30 | 150.367 | 0.944 | n.s. |
| | Social Influence | | | | | | | | | | |
| q0010_0011 | If I use the GFMIS I will increase my chances of obtaining a promotion. | 20 | 190.950 | 64 | 181.547 | 201 | 147.326 | 30 | 157.317 | **0.017** | ** |
| q0010_0012 | If I use the GFMIS I will increase my chances of getting a raise. | 20 | 199.525 | 64 | 180.898 | 201 | 147.281 | 30 | 153.283 | **0.009** | *** |
| q0012_0007 | People in my organisation who use the GFMIS have more prestige than those who do not. | 20 | 207.850 | 64 | 179.773 | 201 | 148.856 | 30 | 139.583 | **0.003** | *** |

****p-value is statistically significant at the 0.01 level (two-tailed); **p-value is statistically significant at the 0.05 level (two-tailed); n.s. = not significant*

The *p*-values (<0.05) of the measurement items for Facilitating Conditions and Social Influence in Table 5.22 indicate significant differences in each of these predictive factors in regard to level of education. However, there is insufficient evidence to conclude that there is a significant difference in Effort Expectancy based on level of education because only one of the measurement items in Effort Expectancy has a *p*-value less than 0.05. There is no significant difference in Performance Expectancy based on level of education (*p*-values>0.05 for all measurement items in Performance Expectancy).

### 5.11.5 Influencing Factors across All Sub-Groups

Table 5.24 adopts a matrix structure from Phonthanukitithaworn's (2015) study for summarising the perception of respondents of different demographic groups to the four predictive factors in the Adapted Original UTAUT model.

Table 5.24 Summary of Testing for the Difference in Influencing Factors across the Demographic Sub-Groups

| **Predictive factors in Use Behaviour and Intention to Use Future Technologies** | Demographic variables | | |
|---|---|---|---|
| | Gender | Education Level | Age |
| Effort Expectancy | ✗ | - | ✗ |
| Facilitating Conditions | - | ✓ | ✓ |
| Performance Expectancy | ✗ | ✗ | ✗ |
| Social Influence | ✓ | ✓ | ✓ |

Note: (-) = the result is inconclusive; (✗) = there are no significant differences between groups; (✓) = there are significant differences between groups.

The summary in Table 5.24 above indicates that:

- There are significant differences among respondents of different Gender group, Ages and Education Level in their perception of Social Influence as a factor in influencing Use Behaviour and Intention to Use Future Technologies.

- Significant differences are noted in the perception of Facilitating Conditions according to different levels of educational qualifications and Age groups. However, there is an inconclusive finding for this predictive factor based on Gender.
- There are no significant differences in Performance Expectancy when respondents are classified into different demographic groups of Gender, Education Level or Age.
- There are no significant differences in Effort Expectancy based on Gender, Age and inconclusive for this predictive factor across different levels of education. As highlighted in Section 5.9, Effort Expectancy does not have a direct causal path to Intention to Use Future Technologies in this study. The results on the impact of the demographic variables on this construct are not likely to provide relevant information for understanding Intention to Use Future Technologies. The summary in Table 5.24 reinforces this situation.

The above suggests that Gender, Education Level and Age matter insofar as the respondents' views on the extent to which the use of the system will lead to personal benefits (social conditions) are concerned. Education and Age are also important demographics when considering respondents' views of job conditions facilitating the use of the system.

## 5.12 Hypothesis of UTAUT Model in this study and New Paths

Table 5.25 shows a summary of all the hypotheses in the Extended UTAUT hypothesis and their respective outcomes from hypothesis testing in the preceding sections in this chapter.

Table 5.25 Summary of all the hypotheses in the Extended UTAUT Model

| Hypothesis Number/ New Paths | Hypothesis | Structural paths | | | Supported |
|---|---|---|---|---|---|
| H1 | Effort Expectancy has a significant positive effect on the Use Behaviour of GFMIS in MOAC | Effort Expectancy | → | Use Behaviour | Untenable |
| H2 | Facilitating Conditions has a significant positive effect on the Use Behaviour of GFMIS in MOAC | Facilitating Conditions | → | Use Behaviour | Yes |
| H3 | Performance Expectancy has a significant positive effect on the Use Behaviour of GFMIS in MOAC | Performance Expectancy | → | Use Behaviour | Yes |
| H4 | Social Influence has a significant positive effect on the Use Behaviour of GFMIS in MOAC | Social Influence | → | Use Behaviour | No |
| H5 | Anxiety has a significant positive effect on the Use Behaviours of GFMIS in MOAC | Anxiety | → | Use Behaviour | No |
| H6 | Attitude has a significant positive effect on the Use Behaviours of GFMIS in MOAC | Attitude | → | Use Behaviour | No |
| H7 | Self-Efficacy has a significant positive effect on the Use Behaviour of GFMIS in MOAC. | Self-Efficacy | → | Use Behaviour | No |
| H8 | Perceived Credibility has a significant positive effect on the Use Behaviours of GFMIS in MOAC | Perceived Credibility | → | Use Behaviour | No |
| H9 | Intention to Use Future Technologies has a significant a positive effect on the Use Behaviour of GFMIS in MOAC. | Intention to Use Future Technologies | → | Use Behaviour | No |
| H10 | There is a significant difference in each predictive factor according to the Age group. | Age | → | Effort Expectancy | No |
| | | Age | → | Facilitating Conditions | Yes |
| | | Age | → | Performance Expectancy | No |
| | | Age | → | Social Influence | Yes |
| H11 | There is a significant difference in each predictive factor according to Gender. | Gender | → | Effort Expectancy | No |
| | | Gender | → | Facilitating Conditions | Inconclusive |
| | | Gender | → | Performance Expectancy | No |
| | | Gender | → | Social Influence | Yes |
| H12 | There is a significant difference in each predictive factor according to education level. | Education Level | → | Effort Expectancy | Inconclusive |
| | | Education Level | → | Facilitating Conditions | Yes |
| | | Education Level | → | Performance Expectancy | No |
| | | Education Level | → | Social Influence | Yes |

Table 5.26 shows a summary of all the new paths in the Extended UTAUT model.

Table 5.26 Summary of all the new paths in the Extended UTAUT model

| **Hypothesis Number/ New Paths** | **Hypothesis** | **Structural paths** | | |
|---|---|---|---|---|
| New Path | Facilitating Conditions has a significant positive effect on the Intention to Use future Technologies of GFMIS in MOAC | Facilitating Conditions | → | Intention to Use future Technologies |
| New Path | Performance Expectancy has a significant positive effect on the Intention to Use future Technologies of GFMIS in MOAC | Performance Expectancy | → | Intention to Use future Technologies |
| New Path | Social Influence has a significant positive effect on the Intention to Use future Technologies of GFMIS in MOAC | Social Influence | → | Intention to Use Future Technologies |

Table 5.27 shows a summary of all the hypotheses and new paths of the Adapted Original UTAUT Model

Table 5.27 Summary of all the hypotheses and new paths of the Adapted Original UTAUT Model

| | | | | | |
|---|---|---|---|---|---|
| H1 | Effort Expectancy has a significant positive effect on the Use Behaviour of GFMIS in MOAC | Effort Expectancy | → | Use Behaviour | Untenable |
| H2 | Facilitating Conditions has a significant positive effect on the Use Behaviour of GFMIS in MOAC | Facilitating Conditions | → | Use Behaviour | Yes |
| H3 | Performance Expectancy has a significant positive effect on the Use Behaviour of GFMIS in MOAC | Performance Expectancy | → | Use Behaviour | Yes |
| H4 | Social Influence has a significant positive effect on the Use Behaviour of GFMIS in MOAC | Social Influence | → | Use Behaviour | No |
| H10 | There is a significant difference in each predictive factor according to the Age group. | Age | → | Effort Expectancy | No |
| | | Age | → | Facilitating Conditions | Yes |
| | | Age | → | Performance Expectancy | No |
| | | Age | → | Social Influence | Yes |
| H11 | There is a significant difference in each predictive factor according to Gender. | Gender | → | Effort Expectancy | No |
| | | Gender | → | Facilitating Conditions | Inconclusive |
| | | Gender | → | Performance Expectancy | No |
| | | Gender | → | Social Influence | Yes |
| H12 | There is a significant difference in each predictive factor according to education level. | Education Level | → | Effort Expectancy | Inconclusive |
| | | Education Level | → | Facilitating Conditions | Yes |
| | | Education Level | → | Performance Expectancy | No |
| | | Education Level | → | Social Influence | Yes |
| New Path | Facilitating Conditions has a significant positive effect on the Intention to Use future Technologies of GFMIS in MOAC | Facilitating Conditions | → | Intention to Use future Technologies | |
| New Path | Performance Expectancy has a significant positive effect on the Intention to Use future Technologies of GFMIS in MOAC | Performance Expectancy | → | Intention to Use future Technologies | |
| New Path | Social Influence has a significant positive effect on the Intention to Use future Technologies of GFMIS in MOAC | Social Influence | → | Intention to Use Future Technologies | |

## 5.13 Conclusion

Although 512 of 600 of the voluntary surveys given to employees of MOAC of Thailand discussing their use of the GFMIS were returned, 112 were incomplete and 85 were removed as outliers. The majority of the respondents were female (86%), 25-44 years of age (63.5%) and had a Bachelors degree or better (75.8%). The average response to the survey, between 4-5 for positive statements and 3-4 for negative statements, indicates sleight support for the GFMIS.

For each of the constructs, development of the one-factor congeneric models involved eliminating all but three of the items. For Use Behaviour and Social Influence, all but one of the items were eliminated; EFA identified two items from Performance Expectancy that were relevant to them. All of these constructs were supported by fit indices within acceptable limits. All of the constructs had convergent validity, reliability and discriminant validity within acceptable levels, save Effort Expectancy, in which the AVE and α were both slightly below them, but the values were deemed sufficiently close to the threshold values to proceed.

All the constructs were combined to form the Extended UTAUT model, but measurement and structural analysis indicated that this model was a poor fit; with five out of six and three out of six fit indices within acceptable limits, respectively. Therefore a simplified model, using only Effort Expectancy, Facilitating Conditions, Performance Expectancy, Social Influence, Intention to Use Future Technologies and Use Behaviour was modified from the Original UTAUT model. This model was dubbed the Adapted Original UTAUT model, to distinguish it from the very similar Original UTAUT model developed by Venkatesh et al. (2003). Measurement and structural analysis showed that this model was a far better fit, with all six fit indices within acceptable limits in both cases. Multicollinearity tests determined the distinctness of all six constructs used in this model.

Path analysis found a number of differences between Adapted Original UTAUT model and Venkatesh's Original UTAUT model. In the Adapted Original UTAUT model, Effort Expectancy was isolated, with no direct relationship between Intention to Use Future Technologies, as in Venkatesh's model, or Use Behaviour. Facilitating Conditions was directly related to Use

Behaviour ($p$<0.01), as in Venkatesh's model, along with Intention to Use Future Technologies ($p$<0.05). Performance Expectancy was directly related to Intention to Use Future Technologies ($p$<0.01), as in Venkatesh's model, along with Use Behaviour ($p$<0.01). As in Venkatesh's model, Social Influence was related to Intention to Use Future Technologies ($p$<0.01), but uniquely in the Adapted Original UTAUT model this effect was a negative, rather than positive. Furthermore, Social Influence also had a positive related with Use Behaviour ($p$<0.05). Finally, there was no significant relationship between Intention to Use Future Technologies and Use Behaviour, as was observed in Venkatesh's Original UTAUT model.

The Mann-Whitney U test were used to determine the effect of Gender and the Kruskal Wallis Test were used to determine the effect of Age and Education level on the effects of Effort Expectancy, Facilitating Conditions, Performance Expectancy and Social Influence on Intention to Use Future Technologies and Use Behaviour. Gender and Age had no significant effect on Effort Expectancy's effects on Intention to Use Future Technologies and Use Behaviour, while Education Level's effects on the effects of Effort Expectancy were inconclusive. Education Level and Age had a significant effect on Facilitating Conditions effects on Intention to Use Future Technologies and Use Behaviour, while Gender's effects on the effects of Facilitating Conditions were inconclusive. Gender, Education Level and Age had no significant effect on the effects of Performance Expectancy. The effects of Social Influence were all significantly affected by Gender, Education Level and Age. The research findings and their implications are discussed in Chapter 6.

# CHAPTER SIX
# DISCUSSION AND CONCLUSIONS

## 6.1 Introduction

The research began with the goal of identifying the factors that influence the adoption of information and communications technology, specifically the GFMIS, within the MOAC of Thailand. To test this, four constructs from older models, including the Social Cognitive Theory model (SCT) (Bandura 1986), model of Perceived Consequences (PC) (Thompson et al. 1991) and the Motivational Model (MM) (Davis et al. 1992) were added to the four present in the Original Unified Theory of Acceptance and Use of Technology (UTAUT) model, devised by Ventakesh et al. (2003) to create the Extended UTAUT model. A questionnaire was developed to gather responses to statements designed to measure these constructs and record demographic information of the participants. Of the 512 forms that were returned by employees of 12 departments of the MOAC, only 315 were usable after outliers and incomplete responses were removed from the analysis. Descriptive statistical analysis (mean and standard deviation) indicated weak support for the GFMIS.

Structural Equation Modelling (SEM) analysis indicated that the Extended UTAUT model was a poor fit for the observed data from the MOAC, with only two of its six goodness of fit indices being within acceptable levels. Accordingly, the Original UTAUT model was modified to the Adapted Original UTAUT model. This model had four independent constructs: Effort Expectancy, Facilitating Conditions, Performance Expectancy and Social Influence, acting on two dependent constructs: Intention to Use Future Technologies and Use Behaviour, the interactions between which being potentially mitigated by three demographic factors, Age, Gender and Education Level. The Adapted Original UTAUT model achieved a model fit, all six goodness of fit indices being within acceptable limits.

The pathways of the Adapted Original UTAUT model were very different from that of the Original model. Effort Expectancy was isolated, affecting neither dependent construct. Facilitating Conditions and Performance Expectancy has significant positive effect on both Intention to Use

Future Technologies and Use Behaviour. Social Influence has a significant positive effect on both Intention to Use Future Technologies, but a significant negative effect on Use Behaviour. Intention to Use Future Technologies had no direct related to with Use Behaviour.

Non-parametric tests were used to test for any mediating effects of the demographic factors on the effects of the independent constructs. Gender and Age had no impact on the effects of Effort Expectancy, while the impact of Education Level was inconclusive. Age and Education Level both mediated the effects of Facilitating Conditions, while the effect of Gender on Facilitating Conditions was inconclusive. None of the demographic factors exerted any influence on the effects of Performance Expectancy. All of the demographic factors mediated the effects of Social Influence.

In this chapter the possible underlying reasons for these results, their implications for management decisions in the future and the possibilities they open for future research are discussed.

## 6.2 Major Findings

The major findings of this study are summarised, interpreted and compared to previous findings in the academic literature. As with the study itself, this section is sub-divided into a discussion of the demographic features of the respondents and the analysis of factors influencing the respondents' Intention to Use New Technologies and Use Behaviour of the GFMIS.

### 6.2.1 Response Rates, Respondent Characteristics and Descriptive Statistics

Of the 600 questionnaires that were distributed to 12 of 14 departments of the MOAC (Chieochan and Lindley 2000) in Thailand, 512 were returned, indicating a very positive response to the survey, although the survey was entirely voluntary and the letter to participants specified that employees could withdraw at any time. After incomplete results and outliers were removed, 315 remained for analysis.

The questionnaire recorded the employee's Age, Gender and Education Level. The Gender of the respondents was heavily skewed, with 86.5% of respondents being female. This is in keeping with both the proportion of women working for the MOAC, and the overall trend in Thailand showing women use the internet more than men (UNPAN 2014).

Generally the respondents were of young working age; 37.5% of the respondents were aged from 25 to 34, rising to 63.5% and when the respondents aged from 35 to 44 were added. Given that people between 25 and 44 only made up 32% of the Thai population (Population Pyramids of the World 2015), employees of this age range were greatly overrepresented. In contrast, employees from 18 to 24 were in the minority, making up only 9.5% of respondents, while employees between 45 and 64 made up 27% of respondents, comparable to the 26.1% of the Thai population as a whole in 2012 (Population Pyramids of the World 2015). Such a large proportion of internet-using elderly employees goes against the trend of Thailand as a whole, where internet usage was shown to be uncommon in people over 50 (IMC Institute and ATCI 2014).

The over-representation of internet usage by elderly staff may be attributed to the well-educated nature of the staff; 94.2% of the staff had a tertiary education, and 75.8% having a bachelor degree or better.

Perhaps as a result of the large number of educated respondents, the descriptive statistics (mean and S.D.) calculated from the responses to the questionnaire, demonstrated a slightly supportive attitude for using the GFMIS. Given that this attitude was consistent for statements that were positive and negative towards the GFMIS, this slight support appears to be a considered opinion rather than a rushed response.

### 6.2.2 Factors influencing the MOAC employees to adopt GFMIS

In this study, the role of eight independent constructs (Effort Expectancy, Performance Expectancy, Social Influence, Facilitating Conditions, Anxiety, Attitude, Self-Efficacy and Perceived Credibility) on two dependent constructs (Intention to Use Future Technologies and Use Behaviour), as well as the effect Intention to Use Future Technologies had on Use Behaviour were tested using SEM techniques. Non-parametric tests were used to test for any moderating effects of Age, Gender and Education Level on the interactions between the dependent and independent variables. The results are summarised on Table 6.1 below, followed by a discussion of each finding in detail.

Table 6.1 Factors influencing the MOAC employees to adopt GFMIS

| Hypotheses | Variables | Results of this study | Conclusion | Results of prior studies |
|---|---|---|---|---|
| **H1** Effort Expectancy has a significant positive effect on Use Behaviour | **Independent Variables:** Effort Expectancy **Dependent variables:** Use Behaviour | Untenable | Effort Expectancy did not show a significant influence on use behaviour | □ Showed significant positive employee intention to use & exploit ICT for better performance (Venkatesh et al. 2007).<br>□ Was dominant role in student's intention to use e-government (San and Herrero 2012).<br>□ Effort Expectancy is increasingly important for public acceptance (Dulle and Minishi-Majanja 2011).<br>□ Adoption ICT automated feedback system showed Effort Expectancy construct had the least influence on Use Behaviour compared to the other constructs (Debuse et al. 2008).<br>□ IT experience negatively influenced Effort Expectancy's effect on Intention to Use (Davis, 1989; Szaijna, 1996; Venkatesh et al. 2003; Kim and Malhotra 2005; Schaupp and Carter, 2005; Malhotra et al. 2006; and Al-Gahtani et al. 2007).<br>□ Effort Expectancy was non-significant for predicting behavioural intention to use mobile advertising (He and Lu 2007) and 3G mobile communication and to use mobile banking (Wu et al. 2007; Cheng et al. 2008).<br>□ Meta-analysis determined that Effort Expectancy was not relevant in predicting use behaviour and intention to use (Taiwo and Yang 2007).<br>□ Effort Expectancy did not have a significant influence on behavioral intention to use virtual learning environment adoption (Šumak et al. 2011).<br>□ No significance for predicting Intention to Use on the behaviour of elderly users computer interface to control a robot (Heerink et al. 2009 cited in Taiwo and Downe 2013). |

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| **H2** Facilitating Conditions has a significant positive effect on Use Behaviour | **Independent Variables:** Facilitating Conditions **Dependent variables:** Use Behaviour | Supported | Facilitating Conditions significantly influenced Use Behaviour and, in a newly discovered path, Intention to use Future Technologies | Increased experience is a facilitating condition for adoption (Vankatesh et al. 2003).<br>Potential that adoption of technology is influenced by Facilitating Conditions (Vankatesh et al. 2003).<br>Facilitating Conditions do influence students' use of e-government (AlAwadhi and Morris 2008).<br>Found to influence acceptance of 3G mobile service in Taiwan Wu et al. (2007); towards mobile advertising (He and Lu 2007); and internet banking (Cheng et al. 2008).<br>Facilitating Conditions were significant for predicting "actual use" of TVEPS (Khalil and Al Nasrallah, 2007: 17).<br>Facilitating Conditions (perceived as support from institution) were found to have an overall influence on use behavior (Debuse et al. 2008).<br>Facilitating Conditons are positively linked to knowledge sharing behaviour when using virutal platforms (Kasim 2015)<br>Intent to use health care technology (e-records) in Thailand significantly influenced by Facilitating Conditions (Phichitchaisopa and Naenna 2013). |
| **H3** Performance Expectancy has a significant positive effect on Use Behaviour | **Independent Variables:** Performance Expectancy **Dependent variables:** Use Behaviour | Supported | Performance Expectancy significantly influenced Use Behaviour and, in a newly discovered path, Intention to use Future Technologies | Performance Expectancy significantly influences use behavior (Vankatesh et al. 2003)<br>Includes the PU, motivation and job fit constructs (Vankatesh et al. 2003).<br>Performance Expectancy is an extrinsic motivator (leads to valid outcome) for technology acceptance (Lee et al. 2005; Venkatesh et al. 2003).<br>Performance Expectancy positively influenced use intention for e-government (Carter and Belanger, 2004b; Schaupp and Carter, 2005: AlAwadhi and Morris 2008; ALAwadhi and Morris 2009).<br>Performance Expectancy high predictor of nurses intention to use medical teleconferencing application. (Biemans et al. 2005; Lee et al. 2005).<br>Acceptance of internet-based learning medium: The role of extrinsic and intrinsic motivation. Performance Expectancy found to influence acceptance of 3G mobile service in Taiwan (Wu et al. 2007); towards mobile advertising (He and Lu 2007); and internet banking (Cheng et al. 2008). |

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|---|---|---|---|---|
| **H4** Social Influence has a significant positive effect on Use Behaviour | **Independent Variables:** Social Influence **Dependent variables:** Use Behaviour | Not Supported | Social Influence was found to have a significant negative effect on Use Behaviour and, in a newly discovered path, a significant positive effect on Intention to use Future Technologies | Social Influence is component that affects the adoption (Fan et al. 2005).<br>Level of satisfaction of others affects user's acceptance of technology (Fan et al. 2005).<br>Improve cogency and overall power for intranet use and acceptance (Alkhunaizan and Love 2012).<br>Educators did not agree that Social Influence was influential on their decision to use an automated feedback system (Debuse et al. 2008).<br>Social Influence was found to be insignificant for adoption as Intention to Use of e-government in KSA (Alshehri et al. 2012a).<br>Social Influence was found to be statistically insignificant for students' adoption of ICT (Attuquayefio and Addo 2014).<br>Social Influence did not influence students' adoption of an email system (Alraja 2015). |
| **H5** Anxiety has a significant positive effect on Use Behaviour | **Independent Variable**: Anxie**ty** **Dependent Variable:** Use Behaviour | Not Supported | Anxiety did not significantly influence Use Behaviour | Computer anxiety significantly influences adoption of technology (Ellis and Allaire 1999; Czaja et al. 2006).<br>Anxiety influenced by performance and by Performance Expectancy (Carlsson et al. 2006).<br>Anxiety did not directly influence the Intention to Use (Venkatesh et al. 2003).<br>Anxiety does not determine intention to use (Al Awadhi 2009).<br>Anxiety was not supported by model for adoption and Intention to Use in the Punjab Pakistan (Malik et al. 2016).<br>Anxiety was not supported by UTAUT mode assessing e-district adoption in Assam, India (Baishya et al. 2017). |
| **H6** Attitude has a significant positive effect on Use Behaviour | **Independent Variable**: Attitude **Dependent Variable**: Use Behaviour | Not Supported | Attitude did not significantly influence Use Behaviour | Attitude influences consumer's intention to use technology (Nuangjamnong 2010).<br>Attitude towards (mobile commerce) technology adoption considerably impacts general technology acceptance (Alkhunaizan and Love 2012).<br>Not direct determinant for intention to use (Venkatesh et al. 2003).<br>Removed from precursor model of UTAUT (Carter and Belanger 2005).<br>Was not determined as significant construct for UTAUT so removed (Chang et al. 2006; AlAwadhi and Morris 2008).<br>Attitude was not supported as a direct determinant in UTAUT model (Moghavvemi et al. 2013). |

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|---|---|---|---|---|
| **H7** Self-Efficacy has a significant positive effect on Use Behaviour | **Independent Variable**: Self-Efficacy **Dependent Variable**: Use Behaviour | Not Supported | Self-Efficacy did not significantly influence Use Behaviour | Self-efficacy coupled with increased tech use are less influenced by anxiety (Igbaria and Iivari 1995).<br>Influences anxiety towards a new tech system (Carlsson et al. 2006) indirect construct of self-perception of ability on a specific system or new technology (Venkatesh et al. 2003; Straub 2009).<br>Self-Efficacy is not a direct influence on Use Behavior or Intention to Use (Bandura and Adams 1977; Bandura 1997; and Venkatesh et al. 2003).<br>Is not measured by UTAUT as a direct construct towards use behavioural (Moghavvemi et al. 2013). |
| **H8** Perceived credibility has a significant positive effect on Use Behaviour | **Independent Variable**: Perceived Credibility **Dependent Variable**: Use Behaviour | Not Supported | Perceived Credibility did not significantly influence Use Behaviour | The variety of perceived credibility associations will have influence on intention to use and adoption (Sharma 2007).<br>Perceived credibility has negative associations for new tech use (Sharma 2007).<br>The assumed risks component of Perceived credibility influenced usefulness and ease of use (Khan and Pessoa 2010a), E-banking in developing versus developed countries (Yuen 2010) and e-banking with mobile technology (Yuen 2010).<br>Perceived Credibility was considered as an external factor with no direct relationship to Use Behavior or Intention to Use in the following studies-banking in Malaysia (Yeow et al. 2008), E-government smart cards (Loo et al. 2009), E-banking in Malaysia (YenYuen and Yeow 2009).<br>Not significant as construct for behavioural intention (Dwivedi et al. 2011; Williams et al. 2011). |
| **H9** Intention to Use Future Technologies has a significant positive effect on Use Behaviour | **Independent Variable**: Intention to Use Future Technologies **Dependent Variable** Use Behaviour | Not supported | Intention to Use Future Technologies did not significantly influence Use Behaviour | Intention to Use is not the definitive factor in the acceptance of an organisation**'**s technology **(**Al Awadhi 2009**).**<br>Intention to Use did not significantly influence the use behavior of citizens in Qatar (Al-Shafi and Weerakkody 2009).<br>Precipitating events have a more significant influence than Intention to Use on Use Behavior of IT innovations (Moghavvemi et al. 2013).<br>When individual differences are considered, beliefs have a greater influence than intention to use eLearning (Punnoose 2012). |

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| **H 10**<br>There is a significant difference in each predictive factor according to the Age group | **Moderating Variable:**<br>Age<br>**Dependent Variable:**<br>Use Behaviour | Respondents in different Age groups perceived the influence of Facilitating Conditions and Social Influence differently in the Use Behavior and Intention to Use Future Technologies | Age moderates Facilitating Conditions and Social Influence.<br><br>Age does not moderate Effort Expectancy or Performance Expectancy. | Age moderates use and factors that influence adoption and system acceptance (mobile banking) (Yu 2012).<br>Younger people accept new technology more readily than older (Lu et al. 2003; Yu 2012).<br>E-banking services confirmed the influence of age on use behaviour **(**Ghalandari 2012**).**<br>Age was found to moderate Effort Expectancy and Social Influence on mobile learning use intention (Wang et al. 2009) |
| **H 11**<br>There is a significant difference in each predictive factor according to Gender | **Moderating Variable:**<br>Gender<br>**Dependent Variable:** Use Behaviours | Respondents of different genders perceived the influence of Social Influence differently in the Use Behaviour and Intention to Use Future Technologies | Gender moderates Social Influence.<br><br>Gender does not moderate Effort Expectancy and Performance Expectancy.<br><br>Gender has an inconclusive effect on Facilitating Conditions. | Studies show gender predictions of microcomputer use report contradictory results (Igbaria and Iivari 1995).<br>Men prioritise usefulness & women prioritise ease of use (Venkatesh 2000).<br>Men focus on immediate tasks more than women (Venkatesh et al. 2003)<br>Women reported concern for intention to use internet services focused upon low self-efficacy & higher computer anxiety than men (Nysveen et al. 2005).<br>UTAUT was basis of ICT adoption of a South East Asian government; discerned no gender differences (Gupta and Jana 2003) |

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| **H 12**<br>There is a significant difference in each predictive factor according to Education Level | **Moderating Variable:**<br>Education Level<br>**Dependent Variable:**<br>Use Behaviours | Respondents of different education levels perceived the influence of Facilitating Conditions and Social Influence differently in the Use Behaviour and Intention to Use Future Technologies | Education Level moderates Facilitating Conditions and Social Influence.<br><br>Education Level does not moderate Performance Expectancy.<br><br>Education Level has an inconclusive effect on Effort Expectancy. | • The higher education levels of a person, the stronger their comfort level with technology acceptance (Mathieson et al. 2001).<br>• Individuals with high education levels perceive technology as a path to success so accept technology and motivated to become proficient in use (Legris et al. 2003)<br>• Educational level was found to be an important factor to predict mobile service adoption (Chan and Chong 2013; Chung, 2014; Zhang et al. 2016). |

#### *6.2.2.1 Effort Expectancy*

In this study, the Effort Expectancy construct was defined as the degree to which the user believed the system would be easy to use (Akbar 2014). Hypothesis 1, that Effort Expectancy would have a positive effect on Use Behaviour, was found not to be relevant to the current research, as Effort Expectancy had no direct influence on Use Behaviour of the GFMIS in the MOAC of Thailand in the Adapted Original UTAUT model. Furthermore, Effort Expectancy had no direct influence on Intention to Use Future Technologies in this model.

This result is similar to some other modelling studies relating Effort Expectancy to Use Behaviour of a new technology. For example, Cheng et al. (2008) found that neither intention to adopt, nor adoption of internet banking was influenced by Effort Expectancy. A research study on virtual learning environment adoption found that Effort Expectancy did not have a significant influence on behavioural intention to use the new technology (Šumak et al. 2011). Effort Expectancy was determined to have no significance for predicting Intention to Use on the behaviour of elderly users' acceptance of a screen agent to control an interface robot (Heerink et al. 2009, cited in Taiwo and Downe 2013).

Of particular interest are findings by Davis (1989), Szaijna (1996), Venkatesh et al. (2003), Kim and Malhotra (2005), Schaupp and Carter (2005), Malhotra et al. (2006) and AQl-Gahtani (2007) who determined that Effort Expectancy decreases when experience of the system increases. Given that the GFMIS was first introduced to Thailand's MOAC in 2007 (Gfmis 2017), it is a distinct possibility that the experience of the system may reached the point where Effort Expectancy is effectively non-existent.

It is ironic that Effort Expectancy should turn out to have no effect on the model, since its initial inclusion in the model was a borderline matter. With an Average Variance Extracted (AVE) of 0.432, below the accepted threshold of 0.5 (Fornell and Larcker 1981), and a Cronbach's alpha value (α) of 0.665, below the threshold of 0.7 (De Wulf et al. 2001), Effort Expectancy should have removed from the model for having insufficient convergent validity and reliability, respectively. However, since these values were only narrowly below the threshold, a subjective

judgement was made to retain Effort Expectancy in both the Extended UTAUT, a judgement that was extended to the Adapted Original UTAUT. This judgement was effectively undone by the findings of this study, when this construct was found to have no direct influence on either Intention to Use Future Technologies or Use Behaviour in the Adapted Original UTAUT.

#### *6.2.2.2 Facilitating Conditions*

The Facilitating Conditions construct was defined in this study as a user's belief that that organisational and social conditions are in place to support a new system (Akbar 2014). Hypothesis 2, that Facilitating Conditions would have a significant positive effect on Use Behaviour, was confirmed by this study in the Adapted Original UTAUT model. In addition, Facilitating Conditions was found to have a significant positive effect on Intention to Use Future Technologies in the Adapted Original UTAUT.

These findings are consistent with one of the more consistent findings in studies in this area; that Facilitating Conditions contribute to both intent to use and the adoption of new technologies. For example, Facilitating Conditions were also found to influence acceptance of 3G mobile service Wu et al. (2007); and towards mobile advertising (He and Lu 2007); and internet banking (Cheng et al. 2008) in Taiwan. Furthermore, facilitating conditions were significant for predicting "actual use" of the Traffic Violation E-payment System (TVEPS) in Kuwait (Khalil and AlNasrallah 2007: p. 17). Finally, a research study in Thailand found that intent to use health care technology was significantly influenced by Facilitating Conditions (Phichitchaisopa and Naenna 2013), a finding that suggests that the link between Facilitating Conditions and the Intention to Use Future Technologies may be widespread in Thailand.

#### *6.2.2.3 Performance Expectancy*

The construct of Performance Expectancy was defined in this study as the degree to which a user believes that a new system will contribute to improved job performance (Akbar 2014). Hypothesis 3, that Performance Expectancy would have a significant positive effect on Use Behaviour, was confirmed by this study in the Adapted Original UTAUT model. In addition, Performance

Expectancy was found to have a significant positive effect on Intention to Use Future Technologies in the Adapted Original UTAUT.

The link between Performance Expectancy and Use Behaviour is another consistent finding in studies of adoption of new technologies. In Taiwan, Performance Expectancy was found to positively influence acceptance of 3G mobile service (Wu et al. 2007); mobile advertising (He and Lu 2007); and internet banking (Cheng et al. 2008). The link with Intention to Use Future Technologies has also been previously observed, Performance Expectancy was found to be a high predictor of nurses' intention to use a new medical teleconferencing application. (Biemans et al. 2005) and intention to Use e-government was positively influenced by Performance Expectancy in several countries (Carter and Belanger 2004b; Schaupp and Carter, 2005: AlAwadhi and Morris 2008; ALAwadhi and Morris 2009).

#### *6.2.2.4 Social Influence*

In this study, the Social Influence construct refers to the extent to which a user believes that their peers think that a new system should be used (Akbar 2014). The results of testing hypothesis 4, that Social Influence would have a significant positive effect on Use Behaviour, were unexpected. Social Influence was found to have significant effect on Use Behaviour in the Adapted Original UTAUT model, but that effect was negative rather than positive. Oddly, a significant positive effect was identified between Social Influence and Intention to Use Future Technologies in the Adapted Original UTAUT.

These results are in keeping with the ambiguous place of Social Influence in previous studies of technological adoption. Fan et al. (2005) found that the level of satisfaction of others affected a user's acceptance of technology. However, in a study by Debuse et al. (2008), educators did not perceive that Social Influence was influential on their decision to use an automated feedback system to communicate with their students. Furthermore, Social Influence did not influence students' adoption of an email system (Alraja 2015).

The apparent contradictory effects of Social Influence on Intention to Use Future Technologies and Use Behaviour raise concerns about the culture of the MOAC in Thailand. On the one hand, the negative effect of Social Influence on Use Behaviour suggests that employees of the MOAC believe that their peers are at least disapproving of the implementation of the GFMIS; on the other the positive effect on Intention to Use Future Technologies indicates a belief that their peers certainly want to be seen to want to use it. This suggests a culture of duplicity, where people are told what they want to hear, which can only lead to poor outcomes in a government department.

#### *6.2.2.5 Anxiety*

The Anxiety construct is defined in this study as a user's concerns about the potential negative impacts of using an unknown, new technology (Akbar 2014). Hypothesis 5, that that Anxiety would have a positive effect on Use Behaviour, was not found to be relevant to the current research, as this construct was not included in the Adapted Original UTAUT.

The role of Anxiety is ambiguous in the previous literature. Although Ellis and Allaire (1999) and Czaja et al. (2006) found that Anxiety did significantly influence adoption of technology, Anxiety was not found to be significant in a model developed for e-government adoption and Intention to Use in the Punjab, Pakistan (Malik et al. 2016) nor in a model to assess assess e-district adoption in Assam, India (Baishy et al. 2017).

#### *6.2.2.6 Attitude*

A user's overall emotional reaction to the introduction of a new technology was defined in this study as the Attitude construct (Akbar 2014). Hypothesis 6, that that Attitude would have a positive effect on Use Behaviour, was not found to be relevant to the current research, as this construct was not included in the Adapted Original UTAUT.

In a situation similar to that of the Anxiety construct, the status of attitude in previous studies is, at best, mixed. Although Alkhunaizan and Love 2012, found that Attitude considerably impacted technology acceptance, in many other studies Attitude was not supported as a factor and removed

from the UTAUT (Carter and Belanger 2005; Chang et al. 2006; AlAwadhi and Morris 2008), much as it was in this study.

#### *6.2.2.7 Self-Efficacy*

The construct of Self-Efficacy was defined in this study as a user's self-perception of their own effectiveness in using the new technology (Akbar 2014). Hypothesis 7, that that Self-Efficacy would have a positive effect on Use Behaviour, was not found to be relevant to the current research, as this construct was not included in the Adapted Original UTAUT.

Early models did not use Self-Efficacy as a construct because although an individual's performance and motivation are affected by Self-Efficacy, it is not considered to directly impact Use Behaviour and Intention to Use (Bandura and Adams 1977; Bandura 1997). Later, self-efficacy was not considered by Venkatesh et al. (2003) as a direct determinant for Use Behaviour or Intention to Use. Moghavvemi et al. (2013: 249) noted that Self-efficacy is not a construct directly linked to Behavioural Intention.

#### *6.2.2.8 Perceived Credibility*

In this study, the Perceived Credibility construct was defined as the user's belief that the new technology could deliver its promised benefit (Akbar 2014). Hypothesis 8, that that Perceived Credibility would have a positive effect on Use Behaviour, was not found to be relevant to the current research, as this construct was not included in the Adapted Original UTAUT.

Like the Self-Efficacy construct, Perceived Credibility has rarely been accepted as a factor influencing acceptance of new technologies. Perceived Credibility was considered an external variable that does not have a direct relationship with individuals' Use Behaviour and Intention to Use in a number of Malaysian studies investigating acceptance of: e-banking (Yeow et al. 2008), e-government smart cards (Loo et al. 2009), and e-banking (YenYuen and Yeow 2009). Similarly, in several other studies Perceived Credibility was found to be not significant as a construct, and removed from the model (Dwivedi et al. 2011; Williams et al. (2011), as it was in this study.

#### *6.2.2.9 Intention to Use Future Technologies*

Remarkably, Hypothesis 9, that Intention to Use Future Technologies would have a positive effect on Use Behaviour, was not supported by this study, though a direct link between the two dependent constructs existed in the Adapted Original UTAUT, this was found to be non-significant.

This is not the only example where Intention to Use Future Technologies was found to be unlinked to Use Behaviour. Intention to Use did not significantly influence the Use Behavior of citizens towards e-government in Qatar (Al-Shafi and Weerakkody 2009). Al Awadhi (2009) found that Use Behaviour, not intention to use is the definitive factor in the acceptance of an organisation's technology, going as far to argue that Intention to Use did not influences Use Behaviour, but Use Behaviour that influences Intention to Use.

In the case of the MOAC of Thailand, there is another possible interpretation of the disconnection of Intention to Use Future Technologies from Use Behaviour. Social Influence has already been observed as having a positive effect on Intention to Use Future Technologies and a negative one on Use Behaviour. This would initially seem contradictory; how can the consensus of the employees be praising a system, yet complaining as they use it? The separation of Intention to Use Future Technologies from Use Behaviour removes this contradiction and reinforces the suggestion made by the analysis of Social Influence construct: that a culture of duplicity may have become established in the MOAC. Employees may, for a variety of reasons, tell others what they want to hear, and then go on to do something very different.

#### *6.2.2.10 Demographic Factors: Age, Gender and Education Level*

Non-parametric tests were performed on each of the four independent constructs that made up the Adapted Original UTAUT model to determine if they were moderated by any of the demographic factors recorded by the questionnaire.

Age was grouped by the questionnaire into five categories: 18-24, 25-34, 35-44, 45-54 and 55-64. Kruskal-Wallis tests were used to test Hypothesis 10: that there was a significant difference in each predictive factor according to age group. In this study, this hypothesis was confirmed for

Facilitating Conditions and Social Influence, but not confirmed for Effort Expectancy and Performance Expectancy. This finding that Age moderates the effects of independent constructs known to influence Use Behaviour, is consistent with those of Akbar (2013), where age had a significant moderating influence on the relationship between Facilitating Conditions and usage for student acceptance and use of technology.

Gender was recorded by the questionnaire as either male or female. Mann Whitney U tests were used to test Hypothesis 11, that there was a significant difference in each predictive factor according to gender. These tests found that Gender had a moderating influence on Social Influence, no such influence on Effort Expectancy and Performance Expectancy, while leaving its effects on Facilitating Conditions inconclusive. The role of Gender in acceptance of new technologies has been controversial. Igbaria and Iivari (1995) found that Gender influenced technological use. However, Gupta et al. (2008) found no such gender differences when investigating the adoption of information and communications in South East Asia.

Education level was grouped by the questionnaire into four categories: high school, college, bachelor degree and master degree. Kruskal-Wallis tests were used to test Hypothesis 12, that there was a significant difference in each predictive factor according to age group. These tests indicated that Education Level had a moderating influence on Facilitating Conditions and Social Influence, while having none on Performance Expectancy, while leaving its effects on Effort Expectancy inconclusive. A number of previous studies that found Education Level was an important factor in adopting new technologies (Chan and Chong, 2013; Chung, 2014; Zhang 2016).

If the results on each of the four independent constructs are considered as a whole, patterns of effects are more readily discerned.

Table 6.2 Summary Table for the Effects of Demographics on Independent Constructs in the Adapted Original UTAUT Model

| **Predictive factors in Use Behaviour and Intention to Use Future Technologies** | **Demographic variables** | | |
|---|---|---|---|
| | **Gender** | **Education Level** | **Age** |
| Effort Expectancy | ✗ | - | ✗ |
| Facilitating Conditions | - | ✓ | ✓ |
| Performance Expectancy | ✗ | ✗ | ✗ |
| Social Influence | ✓ | ✓ | ✓ |

*Note: (-) = the result is inconclusive; (✗) = there are no significant differences between groups; (✓) = there are significant differences between groups.*

Neither Gender nor Age had an effect on the effects of the Effort Expectancy construct, the degree to which the user believed the system would be easy to use, while one anomalous item with significant differences in Education Level left the effects of that demographic inconclusive. This is at odds with Wang et al. (2009), who found that Age moderated the effects of Effort Expectancy. However, in the Adapted Original UTAUT model, Effort Expectancy construct was isolated, probably because experience of the system has reduced the effects of this construct to almost nothing in the years since the GFMIS had been in operation in the MOAC. In light of this, a lack of demographic moderating effects is unsurprising; it is rather difficult to moderate the effects of something that no longer functions.

Age and Education Level both moderated the effects of the Facilitating Conditions construct, a user's belief that that organisational and social conditions are in place to support a system, while one anomalous item with significant differences in Gender left the effects of that demographic inconclusive. This is unsurprising, both Age and Education Level have the potential to affect what help can be asked for and needs to be given. An older employee, with potentially less experience with computers, may require very different instruction to a young employee who has used computers all their lives. By the same token, an employee with only high school education will have had considerably less formal training than one with a bachelors degree, and may require assistance be given in far less technical terms.

None of the demographic factors had any moderating influence on the effects of the Performance Expectancy construct, the belief that a new system will contribute to improved job performance.

This may be for similar reasons to the lack of moderating effects on Effort Expectancy; the system has been in operation for sufficient time that everyone, regardless of Age, Gender or Education Level, knows what the programme does and how it can be used.

All three of the demographic factors had a moderating influence on the effects of the Social Influence construct, the extent to which a user believes that their peers believe that a new system should be used. Again, this is unsurprising, all three of these demographics have significant potential to influence who their peers are. In an organisation as heavily female-dominated as the MOAC, male employees, with different interests and perspectives, may prefer each other's company. Belonging to a common age group or common education level may give shared experiences which encourage interactions and isolate those that do not share them. Age and Education Level may both be related to position in the hierarchy of the MOAC. This association is suggested in these results by the Kruskal-Wallis test of mediating effect of Age on the Social Influence was higher mean rank for high school educated employees and those aged between 18-24, which suggests that those with these demographics may be seeking higher wages, prestige and promotions than their older or well educated peers. Certainly Age was found to moderate the effects of Social Influence in a similar manner in Wang et al. (2009).

### 6.3 Research Objectives Revisited

*Objective 1: Investigate the factors that influence GFMIS adoption by a governmental department in Thailand, specifically the MOAC.*

The Adapted Original UTAUT model developed in this study found that the independent variables Facilitating Conditions and Performance Expectancy has a significant positive effect on Use Behaviour, while the independent variable Social Influence has a significant negative effect on it (see Section 5.9). Oddly, the dependent variable Intention to Use Future Technologies (itself positively influenced by Facilitating Conditions, Performance Expectancy and Social Influence) did not significantly affect Use Behaviour (see Section 5.9). The effects of Facilitating Conditions were moderated by the demographic factors Age and Education Level, and the effects of Social

Influence were moderated by the demographic factors Age, Gender and Education Level (see Section 5.11).

*Objective 2: Assessing the extent to which the results of this study agree with previous studies performed in Thailand and other countries in the region.*

Several similar studies have been carried out in Thailand and Malaysia; the results of this study do not entirely agree with them, but there are some consistent findings. For example, Phichitchaisopa and Naenna (2013) found that the intention to use electronic health care records in Thailand was significantly influenced by Facilitating Conditions. This research also found that Facilitating Conditions has a significant positive effect on Intention to Use Future Technologies (see Section 5.9).

In a study by Ellis and Allaire (1999), computer anxiety was found to have a significant negative impact on the intention to use e-government in Thailand. Another study carried out in Thailand found that factors influencing the intention to use internet services included Self-Efficacy and Anxiety (Gupta and Debashish 2008). The role of these factors was not supported in this study; neither Self Efficacy nor Anxiety could be retained in the Adapted Original UTAUT model while retaining a good model fit, and both were removed (see Section 5.6).

A study in Malaysia found that Perceived Credibility was an external factor with no direct relationship to Intention to Use or Use Behaviour of either E-banking or Malaysia's e-government smart card (Yeow et al. 2008; Loo et al. 2009; YenYuen and Yeow 2009). In this study, Perceived Credibility could not be retained in the Adapted Original UTAUT model while retaining a good model fit, and was removed (see Section 5.6).

*Objective 3: Addressing the extent to which internal organisational factors (as opposed to external end-users considerations) play a factor in the success of such initiatives.*

Some of the most interesting findings of this study address this issue. The Social Influence construct has a significant positive effect on Intention to Use Future Technologies, while

negatively effecting on Use Behaviour (see Section 5.9). Furthermore, Intention to Use Future Technologies is unconnected with Use Behaviour (see Section 5.8). One interpretation of this is that a duplicitous pattern of behaviour has become established in the MOAC regarding systems like the GFMIS, where a system is openly praised, but privately grumbled about while being used. Such disingenuous behaviour obviously has the potential to affect the success of such initiatives, to say nothing of simultaneously obscuring the failures it produces.

The mediation of the actions of the Facilitating Conditions construct by Age and Educational Level (see Section 5.11) suggest that training and assistance for low educated (low by the standards of MOAC, with high school education only) employee and elderly employee with less experience with computer technology may be lacking as well. Future research could establish what form this additional training and assistance should take.

*Objective 4: Addressing the effectiveness of extending UTAUT in modelling the adoption of e-government systems.*

The proposed Extended UTAUT model did not show a good fit for the input concerning the employees at MOAC in Thailand (see Section 5.6). Through model modification, all the additional independent factors that had been added to the Extended UTAUT model had to be removed, leaving a model that was, in terms of the constituent independent and dependent variables, identical to the Original UTAUT developed by Venkatesh et al. (2003) (see Section 5.7). However, the pathways between the variables differed radically between this Original UTAUT model and the Adapted Original UTAUT model (see Sections 5.8 and 5.9), suggesting that the Original UTAUT was not a perfect model for adoption of GFMIS in MOAC.

## 6.4 Implications for Practice

There were three main findings of this study that could be responded to with changes of practice at the MOAC of Thailand. The most important of these is the lack of a link between Intention to Use Future Technologies and Use Behaviour, while Social Influence promotes the former and suppresses the latter. Overall this suggests that there is a difference in the MOAC between what

employees say about and what they do with the GFMIS. It is difficult to determine what to do about this without determining what the root cause. Employees may be saying what others want to hear for fear of losing face, for fear of seeming foolish, for fear of creating more work for themselves or for fear of bringing reprisals upon themselves, either official from their superiors or social by their peers. Further studies may reveal which one of these is the case, and allowing planning of an appropriate response.

The second most important finding of this study is the moderation of the effects of Facilitating Conditions by both Age and Education Level. This suggests that although systems may be in place to train and assist employees with the GFMIS, not every employee is benefitting equally from them. Those who are most likely to be unsupported by the system are staff with only a high school education, lacking the technical knowledge of their peers, and elderly staff, lacking the hands-on technical experience of their peers. In response, these staff should be offered practical training and assistance, free from the technical detail and jargon. The exact nature of this additional training and assistance could be determined by future research.

The third important finding of this study was the finding that Age, Gender and Education Level all moderated the effects of Social Influence. This probably indicates the formation of social groups within the MOAC, based around these demographic factors, either directly, or indirectly though seniority in the organisation (this remains untested, though it can be hypothesised that this is correlated with age, education level, and possibly gender). The disproportionate responses given by high school educated and 18-24 aged employees, indicates that those demographics are more responsive to recognition and incentives offered to use the GFMIS, because these demographics are among lowest ranking and paid in the MOAC. The formation of social cliques like these is very difficult to deal with, as ultimately they are the product external social factors rather than ones limited to the MOAC. All that can really be done is to acknowledge their presence, and ensure that measures to report and deal with any excesses are in place.

It has been reported that although adoption of the GFMIS was progressing promisingly in 2014 (UNDESA 2014), surveys suggested that it would slow thereafter. The findings of this study may suggest why, in particular the disconnection between Intention to Use Future Technologies and

Use Behaviour. The suggestion that the MOAC may be broken up into social groups, as suggested by the finding that Age, Gender and Education Level all moderated the effects of Social Influence, may magnify this problem. These findings should not come as too much of a surprise; politics of this sort in government departments are the subject of humour in many cultures. It is possible that similar problems may exist in other Thai government departments, as ultimately they are the product of the same society, but without follow-up studies this remains pure speculation.

However, problems of this sort could be dealt with by the establishment of a system by which complaints and recommendations for improvements could be made completely anonymously. In this way feedback can cut across social and hierarchical lines without fear. These suggestions could be added to the planned changes to the GFMIS, in discussion at the time of the study, but remain unimplemented at this time (Thomas 2014). Changes already planned for include better network preparedness and infrastructure (Thomas 2014), which should improve GFMIS accessibility.

## 6.5 Study Limitations and Directions for Future Research

### 6.5.1 Study Limitations

This study faces several limitations. Some are common to all studies of this type, for example since minor changes in setting can change how factors tend to affect information and communications adoption, care must be taken in taking the findings and conclusions of this research outside the adoption of the GFMIS in the MOAC of Thailand. A similar limitation is temporal. The world of technology is quite dynamic, and behaviour and attitudes may deviate from those recorded from the collected data after only a short time. Care must also be taken in extending these findings any significant time after the survey was performed. Another general limitation is the observer effect; in this case the very act reading and filling out the census may have given employees of the MOAC pause to reconsider the role of the GFMIS in their work, with the effect of subsequently raising or lowering their estimates of the GFMIS.

In order to make this survey accessible to all staff members, including those that are not particularly proficient with the internet, printed questionnaires were used in this study. This had the consequence of increasing the amount of time and effort to perform the survey, reducing the

number of employees and that could be tested. By reducing the sample size in this way, the power of the analysis and it generalisability were reduced.

### 6.5.2 Suggestions for Future Research

Ideas for a number of studies have been prompted by the results of this one. One of the more obvious, if expensive in terms of time and money, would be to repeat the study as originally planned using the Survey Monkey software package, over a larger number of staff members from different Thailand government departments that make use of the GFMIS. This would improve the statistical power of any analyses, and their generalisability across Thailand.

Evidence from this study suggests that many of the constructs not found in the Original UTAUT devised by Ventakesh et al. (2003) could be safely removed from such a study, making the survey quicker and easier to do; perhaps reducing the number of incomplete responses that this study had to remove from the analysis. Furthermore it would make the creation of a study with a sample size of at least 100 respondents for each sub-group possible. This research could also incorporate different demographic variables considered for multi-group modelling in SEM using AMOS (Kline 2005). Multi-item measures are reported to have less measurement errors and higher reliability than uni-dimensional models (Churchill 1979). Uni-dimensional items are by their nature unique and specific to the construct being analysed; the within correlation can be too low and the relationship to other constructs is not characterised by high relations (Sebina and Bwalya 1979).

Another question begged by the results of this study is determining the cause of the culture of duplicity suggested by the Adapted Original UTAUT model. This would require a much more qualitative approach, most likely based around interviews. Given the potentially sensitive nature of the results and the response to them, considerable care would be needed to protect the identity of the participants.

Such a qualitative study could be combined with a more general feedback into the GFMIS itself, during the distribution and collection of the questionnaires, a number of anecdotal evidence

concerning the unwieldiness and inefficiency of the GFMIS were collected. These included an interface that was “non-user friendly”, difficult to navigate, and at times painfully difficult to use, a notable example being the need to take and print a screenshot on completion of a task. The targeted addressing of these issues would work to increase the overall acceptance and use of the GFMIS and increase the likelihood of e-government acceptance overall. Such research could be extended to determine what additional training and feedback might be required for demographics that might require it, such as the high school educated or the elderly.

The results of this study, where the Effort Expectancy construct was isolated from both Intention to Use Future Technologies and Use Behaviour, are one of the more puzzling of the study. They suggest a model at the end of the process described by Davis (1989), Szaijna (1996), Venkatesh et al. (2003), Kim and Malhotra (2005), Schaupp and Carter (2005), Malhotra et al. (2006) and AQl-Gahtani (2007), where Effort Expectancy decreases when experience of the system increases. Given that the role of one construct can change so radically over time, apparently ending in having no effects at all, it begs the question of do the roles of other constructs in the models change as well. A time course study could be devised, where regular surveys were given over the course of a new technologies announcement, introduction, and integration into a business, organisation, or community (not necessarily related to the GFMIS, the MOAC, or even Thailand) to see how the roles of the different constructs change as experience of the system is gained by the users.

## 6.6 Concluding Remarks

The Adapted Original UTAUT model ultimately used by this study yielded a number of surprising, but still explicable, results. Effort Expectancy was isolated, affecting neither dependent construct. This result may be an extreme version of a commonly reported observation that the effects of Effort Expectancy decrease with as experience of the system increases. Facilitating Conditions and Performance Expectancy have a significant positive effect on both Intention to Use Future Technologies and Use Behaviour. Social Influence has a significant positive effect on Intention to Use Future Technologies, but a significant negative effect on Use Behaviour. This finding, combined with Intention to Use Future Technologies having no significant effect on Use Behaviour, suggested that a pattern of disingenuous behaviour had become established in the

MOAC regarding the GFMIS, and what is said has very little to do with what is done. A number of possible causes could account for this duplicitous behaviour, ranging from simple desire not to cause disruption of the status quo to fear of social retaliation.

Non-parametric tests were used to test for any moderating effects of the demographic factors on the effects of the independent constructs. Gender and Age had no impact on the effects of Effort Expectancy, while the impact of Education Level was inconclusive; this lack of effect makes sense, a construct that exerts no effects is difficult to moderate. Age and Education Level both moderated the effects of Facilitating Conditions, suggesting that although training and assistance for the GFMIS was in place at the MOAC, some, such as employees with only high school education or elderly employees may not be benefitting from it as well as others. The effect of Gender on Facilitating Conditions was inconclusive. None of the demographic factors exerted any influence on the effects of Performance Expectancy. All of the demographic factors moderated the effects of Social Influence, suggesting the existence of social groups within the MOAC based, either directly or indirectly on these demographic factors.

Although these results suggest that the integration the GFMIS into the MOAC remains imperfect, the weak approval for the GFMIS detected by the descriptive statistics suggest that there is enthusiasm and overall approval for this system in the MOAC of Thailand, and hopefully Thailand as a whole.

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## APPENDICES

Appendix 1 Questionnaire (English Version)

VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

# INFORMATION TO PARTICIPANTS INVOLVED IN RESEARCH

### You are invited to participate

You are invited to participate in a research project entitled 'Identification and Analysis of the Critical Factors in the Adoption and Use of Information and Communication Technology in a Thai Government Department: Practical Implications for e-Government in Thailand'.

This project is being conducted by a student researcher, Wanamina Waehama as part of a DBA at Victoria University under the supervision of Prof Michael McGrath, Dr Axel Korthaus, Dr Michelle Fong from College of Business.

### Project explanation

This study aims to address our primary research question: 'What are the main difficulties encountered by employees in the adoption and use of the Government Fiscal Management Information System (GFMIS) in the Ministry of Agriculture and Cooperation (MOAC)'?

This research is being conducted to identify the key factors that play an important role in influencing adoption of GFMIS in MOAC. Specifically, the study will investigate whether Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Anxiety, Self Efficacy, Perceived Credibility, Attitude, and Intention to Use Future Technologies have significant impact on adoption and use of the GFMIS in the MOAC.

### What will I be asked to do?

We will ask you to complete a questionnaire for your response to different statements. Altogether, the questionnaire will take you approximately 20 minutes to complete. Your participation in this research is completely voluntary and you are free to withdraw from the study at any time without any ramifications. Your confidentiality is also assured.

### What will I gain from participating?

You will contribute to a research project which is considered to be important in improving our understanding of the factors that play a role in the adoption and use of ICT in MOAC. The benefits of this research is to provide the better resources and support for the use of GFMIS as well as the other similar e-government application that you using in your department.

### How will the information I give be used?

Information collected from this study will be aggregated, de-identified and analysed to inform a thesis on the adoption and use of ICT in MOAC. No information that could identify you personally will be recorded and it will not be possible to identify individual responses. The data that will be collected

during the study may be published in peer-reviewed journals or the findings of the study may be presented to the Thai Government and other institutions for further research and implementation.

**What are the potential risks of participating in this project?**

There are no known potential risks associated with participating in this project. Confidentiality is assured. Participants can choose to opt out of the survey and have their information deleted at any time during or after the survey.

**How will this project be conducted?**

The research study is based on the quantitative research method. The researcher will collect the responses through structured questionnaires via online survey and face to face survey, and the data will be analysed through statistical tools including hypothesis testing and regression analysis.

**Who is conducting the study?**

[Prof Michael McGrath Chief Investigator Contact number: +603 9919 4627 Michael.McGrath@vu.edu.au]

[Wanamina Waehama Student Investigator Contact number: +604 5266 2326 waehama.n@gmail.com]

Any queries about your participation in this project may be directed to the Chief Investigator listed above.

If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

## QUESTIONNAIRE

VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

Q1 Have you completed this survey before?

- ☐ Yes, thank you for answering the survey
- ☐ No, please provide your responses to the following statements

Q2 Is the GFMIS supposed to help you do your job

- ☐ Yes, please provide your responses to the following statements
- ☐ No, thank you for your attention
- ☐ I don't know, please provide your responses to the following statements

Q3 What's your Gender

- ☐ Male
- ☐ Female

Q4 Age

- ☐ 18 to 24
- ☐ 25 to 34
- ☐ 35 to 44
- ☐ 45 to 54
- ☐ 55 to 64
- ☐ 65 and above

Q5 Level of Education

- ☐ High School
- ☐ College/Tafe
- ☐ Bachelor Degree
- ☐ Master Degree
- ☐ Phd/Doctorate Degree
- ☐ Other (please specify) _____

Q6 Years of Work Experience

- ☐ Year
- ☐ Month

Q7 Job Type

- ☐ Managerial
- ☐ Operational
- ☐ Other (please specify)_____

## QUESTIONNAIRE

VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

| Q8 VOLUNTARINESS | Strongly Disagree | Disagree | Slightly Disagree | Neither Disagree Nor Agree | Slightly Agree | Agree | Strongly Agree |
|---|---|---|---|---|---|---|---|
| GFMIS functionality is highly-relevant to my job. | | | | | | | |
| I cannot see that the GFMIS will ever be relevant to my job. | | | | | | | |
| For certain parts of my job I have no alternative to using the GFMIS. | | | | | | | |
| I am free to use or not use the GFMIS. | | | | | | | |
| For certain parts of my work I can use a GFMIS alternative if I choose (e.g. Excel or manual method). | | | | | | | |
| I am penalized if I do not use the GFMIS as required. | | | | | | | |
| **Q9 USE BEHAVIOUR** | | | | | | | |
| I use the GFMIS as much as I possibly can. | | | | | | | |
| I am constantly looking for ways to avoid using the GFMIS | | | | | | | |
| It doesn't matter to me whether I use the GFMIS or an alternative (e.g. Excel or manual method). | | | | | | | |
| I prefer to use the GFMIS as compared to the traditional method. | | | | | | | |
| I constantly look to improve my knowledge of the GFMIS (e.g. by exploring new functionality). | | | | | | | |
| I look forward to the release of promised new, improved GFMIS functionality. | | | | | | | |
| **Q10** PERFORMANCE EXPECTANCY | | | | | | | |
| Using the GFMIS in my job enables me to accomplish tasks more quickly. | | | | | | | |
| Using the GFMIS improves my job performance. | | | | | | | |
| I would find the GFMIS useful in my job. | | | | | | | |
| Use of the GFMIS has no effect on the performance of my job. | | | | | | | |

| | Strongly Disagree | Disagree | Slightly Disagree | Neither Disagree Nor Agree | Slightly Agree | Agree | Strongly Agree |
|---|---|---|---|---|---|---|---|
| Use of the GFMIS decreases the time needed for my important job responsibilities. | | | | | | | |
| Use of the GFMIS increases my job effectiveness. | | | | | | | |
| Using the GFMIS improves the quality of the work I do. | | | | | | | |
| Using the GFMIS makes it easier to do my job. | | | | | | | |
| Using the GFMIS increases my productivity. | | | | | | | |
| If I use the GFMIS my co-workers will perceive me as competent. | | | | | | | |
| If I use the GFMIS I will increase my chances of obtaining a promotion. | | | | | | | |
| If I use the GFMIS I will increase my chances of getting a raise. | | | | | | | |
| **Q11 EFFORT EXPECTANCY** | | | | | | | |
| My interaction with the GFMIS is clear and understandable. | | | | | | | |
| I find the GFMIS to be flexible to interact with. | | | | | | | |
| It is easy for me to become skilful at using the GFMIS. | | | | | | | |
| Overall, I find the GFMIS easy to use. | | | | | | | |
| Using the GFMIS takes too much time from normal duties. | | | | | | | |
| Working with the GFMIS is so complicated, it is difficult to understand what is going on. | | | | | | | |
| It takes so long to learn how to use the GFMIS | | | | | | | |
| I believe that it is easy to get the GFMIS to do what I want it to do. | | | | | | | |
| Learning to operate the GFMIS is easy for me. | | | | | | | |
| Using the GFMIS means I spend less time on routine job tasks. | | | | | | | |

| | Strongly Disagree | Disagree | Slightly Disagree | Neither Disagree Nor Agree | Slightly Agree | Agree | Strongly Agree |
|---|---|---|---|---|---|---|---|
| **Q12 SOCIAL INFLUENCE** | | | | | | | |
| People who influence my behavior think that I should use the GFMIS. | | | | | | | |
| My supervisor think that I should use the GFMIS. | | | | | | | |
| I use the GFMIS because of the proportion of my coworkers who use the system. | | | | | | | |
| The senior management of this department has been helpful in the use of the GFMIS. | | | | | | | |
| My supervisor is very supportive of the use of the GFMIS for my job. | | | | | | | |
| In general, the organization has supported the use of the GFMIS. | | | | | | | |
| People in my organization who use the GFMIS have more prestige than those who do not. | | | | | | | |
| People in my organization who use the GFMIS have a high profile. | | | | | | | |
| Having access to the GFMIS is a status symbol in my organization. | | | | | | | |
| **Q13 FACILITATING CONDITIONS** | | | | | | | |
| I have control over using the GFMIS. | | | | | | | |
| I have the resources necessary to use the GFMIS. | | | | | | | |
| I have the knowledge necessary to use the GFMIS. | | | | | | | |
| The GFMIS is not compatible with other systems I use. | | | | | | | |
| A specific person (or group) is available for assistance with GFMIS system difficulties. | | | | | | | |
| Using the GFMIS is compatible with all aspects of my work. | | | | | | | |

| | Strongly Disagree | Disagree | Slightly Disagree | Neither Disagree Nor Agree | Slightly Agree | Agree | Strongly Agree |
|---|---|---|---|---|---|---|---|
| I think that using the GFMIS fits well with the way I like to work. | | | | | | | |
| Using the GFMIS fits with my work style. | | | | | | | |
| **Q14 ANXIETY** | | | | | | | |
| I feel apprehensive about using the GFMIS. | | | | | | | |
| It scares me to think that I could lose a lot of information using the GFMIS by hitting the wrong key. | | | | | | | |
| I hesitate to use the GFMIS for fear of making mistakes I cannot correct. | | | | | | | |
| The GFMIS is somewhat intimidating to me. | | | | | | | |
| I am fearful of losing focus on performing my job while trying to use GFMIS | | | | | | | |
| **Q15 SELF EFFICACY** | | | | | | | |
| I could complete a job or task using GFMIS, if there was no one around to tell me what to do as I go. | | | | | | | |
| I could complete a job or task using GFMIS, if I could call someone for help if I go stuck. | | | | | | | |
| I could complete a job or task using GFMIS, if I had a lot of time to complete the job for which the software was provided. | | | | | | | |
| I could complete a job or task using GFMIS, if I had just the built-in help facility for assistance. | | | | | | | |
| I could complete a job or task using GFMIS, if my co-worker knows how to operate it. | | | | | | | |
| **Q16 PERCEIVED CREDIBILITY** | | | | | | | |
| I do not think this system should have been implemented. | | | | | | | |
| The GFMIS has not delivered the intended benefit. | | | | | | | |

| | Strongly Disagree | Disagree | Slightly Disagree | Neither Disagree Nor Agree | Slightly Agree | Agree | Strongly Agree |
|---|---|---|---|---|---|---|---|
| This system has limited benefit to offer me. | | | | | | | |
| The system has not contributed to my professional development. | | | | | | | |
| The system thus far has not been delivering on its promised benefits to the employees of the organization. | | | | | | | |
| This system has put the operation of the organization at risk. | | | | | | | |
| **Q17 ATTITUDE** | | | | | | | |
| Using the GFMIS is a good idea. | | | | | | | |
| I dislike the idea of using the GFMIS. | | | | | | | |
| Using the GFMIS is pleasant. | | | | | | | |
| I find using the GFMIS to be enjoyable. | | | | | | | |
| The GFMIS makes work more interesting. | | | | | | | |
| Working with the GFMIS is fun. | | | | | | | |
| The GFMIS is okay for some jobs, but not my job. | | | | | | | |
| I like working with the GFMIS | | | | | | | |
| I look forward to those aspects of my job that require me to use the GFMIS. | | | | | | | |
| Using the GFMIS is frustrating for me. | | | | | | | |
| I rely on GFMIS to do my job. | | | | | | | |
| I get bored quickly when using the GFMIS. | | | | | | | |
| **Q18 INTENTION TO USE FUTURE TECHNOLOGIES** | | | | | | | |
| I intend to use the GFMIS in the next 3 months. | | | | | | | |
| I predict I will use the GFMIS in the next 3 months. | | | | | | | |
| I plan to use the GFMIS in the next 3 months. | | | | | | | |
| I will use planned GFMIS extensions in my operations. | | | | | | | |

| | Strongly Disagree | Disagree | Slightly Disagree | Neither Disagree Nor Agree | Slightly Agree | Agree | Strongly Agree |
|---|---|---|---|---|---|---|---|
| I will use planned GFMIS extensions if I am forced by management. | | | | | | | |
| I will be use the planned GFMIS extensions if they make the system easier to operate. | | | | | | | |
| I will use planned GFMIS extension provided it allows me to complete my job as I've always done it or better. | | | | | | | |

---------- Thank you for your kind corporation ----------

Wanamina Waehama

DBA Student
Victoria University

Appendix 2 Questionnaire (Thai Version)

แบบสำรวจการยอมรับของผู้ใช้ GFMIS

VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

**ข้อมูลสำหรับผู้มีส่วนร่วมที่เกี่ยวข้องในการวิจัย**

คุณได้รับเชิญให้มีส่วนร่วมในโครงการวิจัยในหัวข้อ'การระบุและการวิจัยถึงปัจจัยที่สำคัญในการยอมรับและการใช้ข้อมูลและเทคโนโลยีการสื่อสารในทุกกระทรวงของไทย:ผลกระทบในทางปฏิบัติต่อการให้บริการของภาครัฐผ่านเครือข่ายอิเลกทรอนิกส์(E-Government) ในประเทศไทย' โดยโครงการนี้ได้รับการสร้างโดยนักวิจัยนักศึกษา วันอามีนา แวหะมะ (Wanamina Waehama) ซึ่งเป็นส่วนหนึ่งของภาคบริหารธุรกิจดุษฎีบัณฑิตของมหาวิทยาลัยวิกตอเรีย ภายใต้การกำกับดูแลของศาสตราจารย์ ไมเคิล แมคแกรธ (Michael McGrath), ดร.แอ๊กเซล คอร์เธาส์ (Axel Korthaus), ดร.มิเชล ฟง (Michelle Fong) จากวิทยาลัยธุรกิจ

วัตถุประสงค์ของการวิจัยนี้คือการต่อยอดช่องว่างความรู้ โดยเฉพาะอย่างยิ่งในด้านปัจจัยที่มีบทบาทสำคัญในกระทรวงเกษตรและสหกรณ์ (MOAC)โดยความร่วมมือของพนักงานที่มีทัศนคติต่อระบบเทคโนโลยีข้อมูลใหม่ในความหมายกว้างก็คือคำถามการวิจัยหลักของเรามีอยู่ว่า "อะไรคือปัญหาหลัก ที่พนักงานประสบในการยอมรับและใช้ระบบ บริหารการเงินการคลังภาครัฐด้วยระบบอิเลกทรอนิกส์ (GFMIS) ใน MOAC"?

การวิจัยนี้ได้รับการสร้างขึ้นมาเพื่อระบุถึงปัจจัยที่สำคัญที่มีบทบาทสำคัญต่ออิทธิพลการยอมรับของGFMIS ใน MOAC โดยเฉพาะอย่างยิ่งจะตรวจสอบว่า ความคาดหวังผลการดำเนินการ ความคาดหวังในการพยายาม อิทธิพลทางสังคม เงื่อนไขในการอำนวยความสะดวก ความวิตกกังวล ความสามารถของบุคคล ความน่าเชื่อถือที่สัมผัสได้ ทัศนคติ และความตั้งใจในการใช้เทคโนโลยีของอนาคต ที่มีผลกระทบที่สำคัญในการยอมรับและใช้ GFMIS และ MOAC จะขอความร่วมมือให้คุณทำแบบสอบถามที่จะมีข้อความต่างๆ สำหรับการตอบแบบสอบถามของคุณ พร้อมกันนี้แบบสอบถามจะใช้เวลาประมาณ 20 นาที เพื่อแล้วเสร็จ

การมีส่วนร่วมของคุณในวิจัยนี้จะเป็นไปด้วยความสมัครใจอย่างสิ้นเชิงและคุณมีอิสระที่จะถอนตัวออกจากการวิจัยได้ตลอดเวลา โดยไม่มีผลที่จะตามมาใดๆโดยมั่นใจได้ว่าข้อมูลที่คุณให้จะได้รับการเก็บรักษาเป็นความลับ คุณจะมีส่วนช่วยให้โครงการวิจัยที่ได้รับการพิจารณาว่ามีความสำคัญต่อการต่อยอดช่องว่างทางความรู้ในการยอมรับและการใช้ของ ICT และ MOAC โดยผลของการวิจัยนี้อาจนำไปสู่การจัดเตรียมของทรัพยากรบุคคลและการสนับสนุนที่ดีกว่าสำหรับการใช้ของ GFMIS

ข้อมูลที่ได้รับในการศึกษานี้จะได้รับการรวบรวมโดยไม่ระบุนามและได้รับการวิเคราะห์เพื่อรายงานวิทยานิพนธ์ในการยอมรับและการใช้ของ ICT และ MOAC จะไม่มีการบันทึกข้อมูลที่สามารถระบุถึงความเป็นตัวตนของคุณและมันเป็นไปไม่ได้ในการที่จะระบุถึงคำตอบของแต่ละบุคคล การเก็บข้อมูลในระหว่างการศึกษาอาจได้รับการเผยแพร่ในนิตยสารที่มีการตรวจสอบจากคณะผู้เชี่ยวชาญหรืออาจมีการนำเสนอการศึกษาต่อรัฐบาลไทยรวมทั้งสถาบันอื่นๆ เพื่อการวิจัยและการดำเนินการต่อไป จะไม่มีความเสี่ยงใดๆเกี่ยวข้องกับการมีส่วนร่วมในโครงการนี้ และมีการรับรองการรักษาความลับ ผู้มีส่วนร่วมสามารถเลือกที่จะถอนตัวออกจากการสำรวจ และข้อมูลของพวกเขาจะได้รับการลบออกตลอดเวลาในระหว่างหรือหลังจากการสำรวจ

คำถามใดๆเกี่ยวกับการมีส่วนร่วมของคุณในโครงการนี้จะได้รับการส่งตรงไปยังหัวหน้าผู้เชี่ยวชาญที่อยู่ในรายการด้านบนหากคุณมีคำถามหรือข้อร้องเรียนเกี่ยวกับวิธีการที่คุณได้รับการปฏิบัติ คุณอาจติดต่อ Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email researchethics@vu.edu.au หรือโทรศัพท์ (+603)9919 4781-4461 หรือ Wanamina Waehama ที่ wanamina.Waehama@vu.edu.au.

ขอบพระคุณสำหรับความร่วมมือของท่าน

**วันอามีนา แวหะมะ**
Wanamina Waehama

**นักศึกษาผู้ทำการวิจัย**
**มหาวิทยาลัยวิกตอเรีย ออสเตรเลีย**

V.1/2014

แบบสำรวจการยอมรับของผู้ใช้ GFMIS

VICTORIA UNIVERSITY
MELBOURNE AUSTRALIA

Q1 ท่านเคยตอบแบบสำรวจนี้มาก่อนหรือไม่

- ☐ **ใช่ (หากใช่ ก็ขอขอบคุณสำหรับการตอบแบบสำรวจนี้)**
- ☐ ไม่ใช่ (หากไม่ใช่ ขอความกรุณาตอบในข้อ 2 - 17)

Q2 GFMIS สามารถช่วยในเรื่องการทำงานของท่านได้ใช่หรือไม่

- ☐ ใช่ (หากใช่ ขอความกรุณาตอบในข้อ 3 - 17)
- ☐ ไม่ใช่ (หากไม่ใช่ ก็ขอขอบคุณสำหรับการตอบแบบสำรวจนี้)
- ☐ ไม่ทราบ (หากใช่ ขอความกรุณาตอบในข้อ 3 - 17)

Q3 เพศ

- ☐ ชาย
- ☐ หญิง

Q4 อายุ

- ☐ 18 to 24 ปี
- ☐ 25 to 34 ปี
- ☐ 35 to 44 ปี
- ☐ 45 to 54 ปี
- ☐ 55 to 64 ปี
- ☐ 65 ปีขึ้นไป

Q5 การศึกษา

- ☐ มัธยมศึกษาหรือเทียบเท่า
- ☐ อนุปริญญาหรือเทียบเท่า
- ☐ ปริญญาตรี
- ☐ ปริญญาโท
- ☐ ปริญญาเอก
- ☐ อื่น ๆ (โปรดระบุ)_____

Q6 ท่านดำรงตำแหน่งปัจจุบัน

- ☐ ปี
- ☐ **เดือน**

Q7 ตำแหน่งปัจจุบัน

- ☐ ผู้บริหาร
- ☐ **ผู้ปฏิบัติ**
- ☐ อื่น ๆ (โปรดระบุ)_____

| Q8 ความสมัครใจ | | | | | | | |
|---|---|---|---|---|---|---|---|
| | ไม่เห็นด้วยอย่างยิ่ง | ไม่เห็นด้วย | ไม่เห็นด้วยเล็กน้อย | ไม่รู้สึกเห็นด้วยหรือไม่เห็นด้วย | เห็นด้วยเล็กน้อย | เห็นด้วย | เห็นด้วยอย่างยิ่ง |
| GFMIS เกี่ยวข้องกับงานของท่านเป็นอย่างมาก | | | | | | | |
| ท่านท่านไม่เคยคิดว่า GFMIS จะเกี่ยวข้องกับงานของท่าน | | | | | | | |
| บางทีท่านไม่มีทางเลือกอื่นนอกจากต้องใช้ ระบบGFMIS | | | | | | | |
| ท่านมีอิสระที่จะใช้หรือไม่ใช้ GFMIS | | | | | | | |
| สำหรับบางส่วนของการทำงานท่านท่านมีทางเลือกอื่นในการทำงานของท่าน เช่น Microsoft Excel หรือสมุดบัญชีแบบดั้งเดิม | | | | | | | |
| ท่านจะโดนตำหนิถ้าท่านไม่ได้ใช้ GFMIS | | | | | | | |
| **Q9 พฤติกรรมการใช้** | | | | | | | |
| ท่านใช้ GFMIS มากเท่าที่จะมากได้ | | | | | | | |
| ท่านกำลังมองหาวิธีการที่จะหลีกเลี่ยงการใช้ GFMIS | | | | | | | |
| มันไม่สำคัญว่าท่านจะใช้ GFMIS หรือระบบก่อนหน้านี้ | | | | | | | |
| ท่านชอบใช้ GFMIS มากกว่าเมื่อเปรียบเทียบกับวิธีการแบบดั้งเดิม | | | | | | | |
| ท่านจะพยายามพัฒนาและหาความรู้เกี่ยวกับการใช้ GFMIS | | | | | | | |
| ท่านมีความหวังและรอดูการปรับปรุงการทำงานใหม่ของระบบ GFMIS | | | | | | | |
| **Q10 ความคาดหวังผลการดำเนินการ** | | | | | | | |
| การใช้ GFMIS สามารถทำให้ท่านทำงานได้รวดเร็วขึ้น | | | | | | | |
| การใช้ GFMIS จะช่วยปรับปรุงการทำงานของท่าน | | | | | | | |
| ท่านพบว่า GFMIS มีประโยชน์กับงานของท่าน | | | | | | | |
| การใช้ GFMIS จะไม่ส่งผลกระทบต่อผล การทำงานของท่าน | | | | | | | |

| | ไม่เห็นด้วยอย่างยิ่ง | ไม่เห็นด้วย | ไม่เห็นด้วยเล็กน้อย | ไม่รู้สึกเห็นด้วยหรือไม่เห็นด้วย | เห็นด้วยเล็กน้อย | เห็นด้วย | เห็นด้วยอย่างยิ่ง |
|---|---|---|---|---|---|---|---|
| การใช้ GFMIS สามารถลดเวลาที่จำเป็นต้องใช้สำหรับการรับผิดชอบต่องานที่สำคัญของท่าน | | | | | | | |
| การใช้ GFMIS สามารถเพิ่มประสิทธิภาพของผลการการทำงาน | | | | | | | |
| การใช้ GFMIS ปรับปรุงคุณภาพของงานที่ท่านทำ | | | | | | | |
| การใช้ GFMIS ทำให้ง่ายต่อการทำงานมากยิ่งขึ้น | | | | | | | |
| การใช้ GFMIS ช่วยเพิ่มผลผลิตของท่าน | | | | | | | |
| หากท่านใช้ GFMIS เพื่อนร่วมงานจะเข้าใจว่าท่านเป็นพนักงานที่มีความสามารถ | | | | | | | |
| หากท่านใช้ GFMIS โอกาสในการได้รับการเลื่อนขั้นของท่านจะเพิ่มขึ้น | | | | | | | |
| หากท่านใช้ GFMIS โอกาสได้ยกระดับของท่านจะเพิ่มขึ้น | | | | | | | |
| **Q11 ความคาดหวังในการพยายาม** | | | | | | | |
| ท่านสามารถทำงานร่วมกับ GFMIS อย่างเข้าใจและได้ชัดเจน | | | | | | | |
| ท่านพบว่ามีความยืดหยุ่นต่อการใช้ระบบ GFMIS | | | | | | | |
| มันจะง่ายสำหรับท่านในการมีทักษะในการใช้ GFMIS | | | | | | | |
| ท่านจะพบว่า GFMIS ง่ายต่อการใช้งาน | | | | | | | |
| การใช้ GFMIS ใช้เวลาจากงานทั่วไปมากเกินไป | | | | | | | |
| การทำงานกับ GFMIS มีความซับซ้อนและยากที่จะเข้าใจ | | | | | | | |
| ต้องใช้ความพยายามและใช้เวลาในการศึกษาวิธีการใช้ GFMIS | | | | | | | |
| ท่านเชื่อว่า GFMIS สามารถช่วยให้ง่ายต่อการทำงานของท่าน | | | | | | | |

| | ไม่เห็นด้วยอย่างยิ่ง | ไม่เห็นด้วย | ไม่เห็นด้วยเล็กน้อย | ไม่รู้สึกเห็นด้วยหรือไม่เห็นด้วย | เห็นด้วยเล็กน้อย | เห็นด้วย | เห็นด้วยอย่างยิ่ง |
|---|---|---|---|---|---|---|---|
| การศึกษาการใช้ระบบ GFMIS ง่ายสำหรับท่าน | | | | | | | |
| หากท่านใช้ GFMIS ท่านจะใช้เวลาในการทำงานน้อยลง | | | | | | | |
| **Q12 อิทธิพลทางสังคม** | | | | | | | |
| ผู้ที่มีอำนาจต่อท่าน คิดว่าท่านควรใช้ GFMIS | | | | | | | |
| ผู้คับบัญชาของท่าน คิดว่าท่านควรใช้ GFMIS | | | | | | | |
| ท่านใช้ GFMIS เนื่องจากเพื่อนร่วมงานส่วนใหญ่ใช้ | | | | | | | |
| ผู้บริหารระดับสูงของแผนกนี้ได้รับประโยชน์จากการใช้ GFMIS | | | | | | | |
| หัวหน้าของท่านสนับสนุนการใช้ GFMIS สำหรับการทำงานของท่านเป็นอย่างมาก | | | | | | | |
| โดยทั่วไปองค์กรสนับสนุนให้ใช้ GFMIS | | | | | | | |
| ในองค์กรของท่าน ผู้ใช้ GFMIS จะเป็นผู้ที่มีชื่อเสียงมากกว่าผู้ที่ไม่ได้ใช้ | | | | | | | |
| ในองค์กรของท่าน ผู้ใช้ GFMIS จะเป็นผู้บริหารระดับสูง | | | | | | | |
| การใช้ GFMIS ในองค์กรของท่านถือว่ามีเอกลักษ์ของการมีระดับ | | | | | | | |
| **Q13 เงื่อนไขในการอำนวยความสะดวก** | | | | | | | |
| ท่านสามารถควบคุมการใช้ GFMIS | | | | | | | |
| ท่านมีแหล่งข้อมูลที่จำเป็นต่อการใช้ GFMIS | | | | | | | |
| ท่านมีความรู้ที่เพียงพอต่อการใช้ GFMIS | | | | | | | |
| GFMIS ไม่สามารถทำงานร่วมกับระบบอื่นๆที่ท่านใช้ | | | | | | | |
| มีบุคคลที่สามารถให้ความช่วยเหลือเมื่อพบความยุ่งยากของระบบ GFMIS | | | | | | | |
| ท่านสามารถใช้ GFMIS ในทุกด้านของการทำงานของท่าน | | | | | | | |

| | ไม่เห็นด้วยอย่างยิ่ง | ไม่เห็นด้วย | ไม่เห็นด้วยเล็กน้อย | ไม่รู้สึกเห็นด้วยหรือไม่เห็นด้วย | เห็นด้วยเล็กน้อย | เห็นด้วย | เห็นด้วยอย่างยิ่ง |
|---|---|---|---|---|---|---|---|
| ท่านคิดว่าการใช้ GFMIS เหมาะสมกับวิธีที่ท่านอยากทำงานเป็นอย่างดี | | | | | | | |
| การใช้ GFMIS เหมาะสมกับรูปแบบการทำงานของท่าน | | | | | | | |
| **Q14 ความวิตกกังกล** | | | | | | | |
| ท่านรู้สึกกังวลเกี่ยวกับการใช้ GFMIS | | | | | | | |
| มันทำให้ท่านกลัวในการที่จะคิดว่าท่านอาจสูญเสียข้อมูลในการใช้ GFMIS ถ้ากดปุ่มผิด | | | | | | | |
| ท่านลังเลที่จะใช้ GFMIS เพราะกลัวทำผิดพลาดโดยไม่สามารถแก้ไขได้ | | | | | | | |
| ท่านรู้สึกกดดันเมื่อใช้ระบบ GFMIS | | | | | | | |
| ท่านกลัวในการที่จะคิดว่าท่านอาจเสียสมาธิในการดำเนินงานขณะใช้ GFMIS | | | | | | | |
| **Q15 ความสามารถของบุคคล** | | | | | | | |
| ท่านสามารถทำงานเสร็จโดยใช้ GFMIS ถ้าไม่มีใครมา คอยสั่งการ | | | | | | | |
| ท่านสามารถทำงานเสร็จโดยใช้ GFMIS หากท่านสามารถร้องขอให้ใครสักคนช่วยเหลือเมื่อท่านติดขัด | | | | | | | |
| ท่านสามารถทำงานเสร็จโดยใช้ GFMIS หากท่านมีเวลามากพอในการใช้ระบบ | | | | | | | |
| ท่านสามารถทำงานเสร็จโดยใช้ GFMIS หากท่านมีศูนย์ช่วยเหลือ | | | | | | | |
| ท่านสามารถทำงานเสร็จโดยใช้ GFMIS หากท่านเพื่อนร่วมงานของท่านมีความคล่องแคล่วในการใช้ระบบ | | | | | | | |
| **Q16 ความน่าเชื่อถือ** | | | | | | | |
| ท่านไม่คิดว่าระบบนี้ควรจะได้รับการดำเนินการ | | | | | | | |
| GFMIS ไม่มีวัตถุประสงค์เพื่อหวังผลกำไร | | | | | | | |

| | ไม่เห็นด้วยอย่างยิ่ง | ไม่เห็นด้วย | ไม่เห็นด้วยเล็กน้อย | ไม่รู้สึกเห็นด้วยหรือไม่เห็นด้วย | เห็นด้วยเล็กน้อย | เห็นด้วย | เห็นด้วยอย่างยิ่ง |
|---|---|---|---|---|---|---|---|
| ระบบนี้มีผลประโยชน์ที่จำกัดที่จะเสนอให้กับท่าน | | | | | | | |
| ระบบไม่ได้มีส่วนช่วยเหลือต่อการพัฒนาความเป็นมืออาชีพ | | | | | | | |
| เท่าที่ผ่านมาระบบยังไม่ได้มีการให้ผลประโยชน์กับพนักงานของแผนก | | | | | | | |
| ระบบนี้ได้ทำให้การดำเนินการของแผนกมีความเสี่ยง | | | | | | | |
| **Q17 ทัศนคติ** | | | | | | | |
| การใช้ GFMIS เป็นความคิดที่เกิดประโยชน์ | | | | | | | |
| ท่านไม่ชอบความคิดในการใช้ GFMIS | | | | | | | |
| การใช้ GFMIS เป็นสิ่งที่น่ายินดี | | | | | | | |
| ท่านพบว่าการใช้ GFMIS เป็นเรื่องที่น่าสนุก | | | | | | | |
| GFMIS ทำให้การทำงานน่าสนใจมากยิ่งขึ้น | | | | | | | |
| การทำงานกับ GFMIS สนุก | | | | | | | |
| GFMIS ก็ดีสำหรับบางงาน แต่ไม่ใช่ประเภทของงานที่ท่านทำอยู่ | | | | | | | |
| ท่านชอบทำงานกับ GFMIS | | | | | | | |
| ท่านคิดว่าในทุกด้านของงานของท่านจะต้องใช้ระบบ GFMIS | | | | | | | |
| การใช้ GFMIS เป็นเรื่องที่น่าผิดหวังสำหรับท่าน | | | | | | | |
| ท่านไว้ใจ GFMIS สำหรับการทำงานของท่าน | | | | | | | |
| ท่านเบื่อเร็วมากเมื่อต้องใช้ GFMIS | | | | | | | |
| **Q18 ความตั้งใจในการใช้เทคโนโลยีของอนาคต** | | | | | | | |
| ท่านตั้งใจจะใช้ GFMIS ในอีก 3 เดือนถัดไป | | | | | | | |
| ท่านคาดการณ์ว่าท่านจะใช้ GFMIS ในอีก 3 เดือนถัดไป | | | | | | | |
| ท่านวางแผนที่จะใช้ GFMIS ในอีก 3 เดือนถัดไป | | | | | | | |
| ท่านจะใช้ GFMIS ที่อัพเดทแล้วในการดำเนินการทั้งหมดของท่าน | | | | | | | |

| | ไม่เห็นด้วยอย่างยิ่ง | ไม่เห็นด้วย | ไม่เห็นด้วยเล็กน้อย | ไม่รู้สึกเห็นด้วยหรือไม่เห็นด้วย | เห็นด้วยเล็กน้อย | เห็นด้วย | เห็นด้วยอย่างยิ่ง |
|---|---|---|---|---|---|---|---|
| ท่านจะใช้ GFMIS ที่อัพเดทแล้วหากฝ่ายบริหารจัดการบังคับให้ท่านใช้ | | | | | | | |
| ท่านจะใช้ GFMIS ที่อัพเดทแล้วหากการดำเนินการนั้นง่ายกว่า | | | | | | | |
| ท่านจะใช้ GFMIS ที่อัพเดทแล้วตามแผนที่วางไว้ในการช่วยให้ท่านเสร็จสิ้นการทำงาน | | | | | | | |

**---------- ขอขอบพระคุณเป็นอย่างยิ่งที่กรุณาตอบแบบสอบถาม ----------**

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Wanamina Waehama

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**มหาวิทยาลัยวิกตอเรีย ออสเตรเลีย**