A Phenomenon of the Critical Factors of Accounting Information System (AIS) Effectiveness

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Declaration

This thesis is the result of the author's original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.

Signed:

Date:

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Abstract

The complexity of the Government's environment provides greater challenges in making the AIS effective. Prior studies have reported many and inconsistent determinants of system effectiveness, as well as its measurement. This study intends to fill the gaps by understanding the phenomenon of the critical factors of AIS effectiveness for an on-going and stable system. This includes exploring the critical factors of AIS effectiveness and examining the factors that significantly influence the phenomenon. In addition, the condition of the identified factors is investigated based on perceived importance versus perceived performance. The effectiveness of AIS in this study is viewed from the perspective of user satisfaction. This study was conducted using multiple methods (qualitative and quantitative). The qualitative method includes group discussions, observation and semi-structured interviews. The qualitative findings were used to develop a survey questionnaire for the quantitative study on a larger scale.

This study contributes to the literature by presenting a comprehensive measure of AIS effectiveness using a user satisfaction approach. In addition, the results emphasise the AIS main components that are crucial for the achievement of an effective system, which are user commitment, technology support function and teamwork. Furthermore, this study is different to earlier studies in that its findings uncover additional factors that are antecedents for the critical factors of AIS effectiveness. Moreover, the perceived importance-performance gap shows the benefit of the assessment in providing a strategic direction for management. Overall, this study has shed light on the investigated phenomenon by offering: a comprehensive measure of AIS effectiveness; the factors important in achieving an effective system; and further action to be taken by the management and the system's users on each of those factors. Thus, in addition to academic literature contributions, practitioners will also derive benefits from the findings of this study.

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List of Abbreviations

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Activity-Based Costing……...ABC
Association of Chartered Certified Accountants……..ACCA
Accountant General's Department……AGD
American Institute of Certified Public Accountants……...AICPA
Accounting Information System……...AIS
Activity-Based Costing……ABC
Average Variance Extracted……... AVE
Branch Accounting System……BAS
Bias-Corrected and Accelerated……...BCa
Central Operation and Agency Service Division ……...*BPOPA*
Management of Accounting Office Division ……*BPOPP*
Accounting and Management Development Division ……..*BPPP*
Information Technology Development Division ……*BPTM*
Covariance-Based Structural Equation Model……CB-SEM
Chartered Institute of Management Accountants……CIMA
Chartered Institute of Public Finance and Accountancy…… CIPFA
Electronic Data Processing……..EDP
Electronic Fund Transfer……..EFT
Economic Planning Unit……..EPU
Enterprise Resource Planning ……ERP
Electronic Budget Control and Planning System ……*eSPKB*
Standard Collection and Receipting System……..*eTerimaan*
End-User Computing Satisfaction ……EUCS
Government Accounting Standards Advisory Committee……GASAC
Government Financial and Management Accounting System……..GFMAS
General Ledger and Financial Reporting System……..GL/FRS
Government Link Companies……..GLC
Hierarchical Components Model……HCM
Human Resources Management Information System……HRMIS
Heterotrait-Monotrait Ratio……..HTMT
International Federation of Accountants……IFAC

International Financial Reporting Standards……..IFRS
Importance-Performance Analysis……IPA
International Public Sector Accounting Standards……...IPSAS
Information Technology……..IT
Malaysian Accounting Standard Board……...MASB
Multi-Group Analysis……MGA
Malaysian Institute of Accountants……MIA
Management Information System……MIS
Malaysian Public Sector Accounting Standards……MPSAS
Management Reporting System……..MRS
Ordinary Least Squares……OLS
Private Entity Reporting Standards ……...PERS
Pekeliling Kemajuan Perkhidmatan Awam ……..*PKPA*
Partial Least Square……..PLS
Partial Least Squares Structural Equation Model……...PLS-SEM
Self-Accounting Department ……..SAD
Standard Accounting System for Government Agencies…….SAGA
Small and Medium-Sized Enterprises……SME
Standard Operating Procedure…….SOP
State Government's Standard Computerised Accounting System……..SPEKS
Technology Acceptance Model ……TAM
Daily Transaction Processing System……..TPS
Unified Theory of Acceptance and Use of Technology……UTAUT
Venture Capital Investor……...VCI
Variance Inflation Factor……..VIF

CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

Government has a great responsibility to develop the country and serve its citizens. Both the range of industries within the government sector and the size of the government offer great challenges to the management team in government organisations, including accountants. The accountant plays an important role in managing and providing accounting and financial information to the organisation's stakeholders. In today's practice, the accountant is assisted by technology to smooth the accounting process. Therefore, an effective Accounting Information System (AIS) is highly needed to deal with an increased demand for high quality information to support the decision-making process (Chalu, 2012). In response to that, many organisations place a huge investment in technology advancement, in order to improve their AIS (Chalu, 2012; Saleh et al., 2010), including the Malaysian Government. However, that does not guarantee the effectiveness of their AIS. Advanced technology may not be effective if it does not suit the organisation's requirements and is not properly operated. Moreover, it may also be ineffective if its other related components (e.g. humans, infrastructure) do not perform well. In addition, the complexity of the government in terms of its structure and other factors surrounding its environment, such as evolution in technology, political interference, economy and globalisation, add even more challenges to the accounting operations. The size of the organisation and complex structure of the system make the achievement of organisational goals even more difficult, especially in terms of aligning the subsystem and overall organisational goals (Romney et al., 2013).

However, the government should continue to put its effort into improving the AIS and prioritising the effectiveness of the system for better fiscal management.

The AIS in this study is technically defined as a system used to manage accounting data and transform it into information by the support of technology (Pierre et al., 2013; Nicolaou, 2000). The system covers the accounting process from inputs to outputs, as well as its related procedures and regulations. The AIS is vital to all organisations in improving the effectiveness and efficiency of their operations (Wiechetek, 2012; Mgaya and Kitindi, 2008). Other studies view the AIS as one of several support systems providing information (Okab and Al-Oqool, 2014; Noerlina et al., 2011; Dehghanzade et al., 2011; Kharuddin et al., 2010; Salehi et al., 2010; Sori, 2009; Curtis, 1995; Wilkinson, 1993; Borthick and Clark, 1990). Therefore, an effective AIS should be achieved and maintained in order to produce high quality of information, which subsequently leads to a better decision-making process and performance assessment, and which facilitates the organisation's financial activity and control (Sajady et al., 2008). It is essential for the user of the system to understand their organisation, the management and technology applied, in order to have an effective information system in place (Issa-Salwe et al., 2010).

In Malaysia, the Government's efforts in advancing their AIS and its related infrastructures for better accounting practices require the full support of public sector organisations and the users of the system. Effective performance from the system's users, as well as the technology and other related components, are needed for the effectiveness of the AIS. Nevertheless, prior studies conducted on AIS reported too many and inconsistent factors influencing the system effectiveness. The critical factors of AIS effectiveness vary depending on the context and scope of the study.

As such, this study aims to understand the phenomenon of the critical factors of AIS effectiveness and investigate the critical factors of the system's effectiveness. In addition, this study intends to examine the significant factors influencing within the phenomenon. This study also examines the actual conditions of the identified factors, by comparing the perceived *importance* with the perceived *performance* of the factors.

The AIS effectiveness is measured according to a user satisfaction approach. A user satisfaction approach is one among several widely used surrogate measures for success or effectiveness measurement in information system, as well as in AIS. However, the controversy behind this approach is continuously debated among researchers. As far as this study is concerned, a user satisfaction approach is used as it consistent with both the conceptual definition of system effectiveness and the preliminary findings from the qualitative part of this study, which defined effectiveness as meeting the user's requirements. Reviews on user satisfaction as a measure for AIS effectiveness are discussed further in Chapter 2 – Literature Review, section 2.6, page 45 and section 2.6.2, page 67.

1.2 PROBLEM STATEMENT

AIS effectiveness became one of the crucial areas that received significant attention amongst practitioners and academics, due to an increased demand for high quality information for decision-making processes (Chalu, 2012; Sajady et al., 2008). It has seen as further interest because of inconsistent measurements as well as mixed findings on the determinants of the system's effectiveness in prior studies (Chalu, 2012; Sabherwal et al., 2006; Choe, 1996). The factors that were found to have

significant influence on the AIS effectiveness are many, and vary from one study to another. Due to variances in definition, scope and conceptualisation of the system's effectiveness between studies, researchers are still struggling to build determinants that have the greatest influence on information systems or AIS effectiveness (Chalu, 2012; de Guinea et al., 2005).

Furthermore, there are inconsistent measurements of effectiveness in both the information systems and the AIS. The variation in effectiveness measurements is caused by numerous definitions of effectiveness itself (Thong and Yap, 1996). Effectiveness, which is a part of success, is multidimensional in nature (DeLone and McLean, 1992). Thus, it is hard to measure effectiveness directly. Researchers commonly use proxies to measure effectiveness, in which its evaluation may vary from one study to another, depending on the context of the study. These differences in measurements lead to difficulties in comparing results between studies (Gable et al., 2003).

An attempt to answer the call for a standard measurement of information system success was made by DeLone and McLean in 1992. The model is the most popular model used by researchers in measuring information system success, as well as a platform for more research to be done in this area. As evidence for this, the model was respecified, extended and modified by other researchers (e.g. Bach et al., 2011; Gabble et al., 2003; Myers et al., 1997; Seddon, 1997; Pitt et al., 1995) in order to improve the existing model of information system success. Furthermore, the model also used for system effectiveness measurement by other researchers (e.g. Ismail, 2009; Al-Mushayt, 2000); and some researchers (e.g. Chalu, 2012; Thong et al., 1994) partly applied the dimensions in the success model (e.g. information

quality and system quality) to proxy for success measurement. The vagueness of system effectiveness measurement can also be caused by inadequate explanation of the reasons for choosing the dimensions or proxies for effectiveness. Poor measurement with lack of theoretical grounding is among the reasons for mixed results between studies (Gable et al., 2003). The variation in success measurement has also resulted in various measures of effectiveness, which have led to difficulties in comparing the findings between studies. The measurement for effectiveness is continuously debated and no consensus has yet been achieved.

In addition, user satisfaction that was used as a proxy for the measurement of system effectiveness in earlier studies is commonly measured on a scale from disagree to agree, or never to always, rather than measuring the degree of satisfaction. To agree about satisfaction for something, or to always feel satisfied about something, cannot be easily translated into a degree of satisfaction. For example, if the respondent strongly agrees that he or she is satisfied with his or her new computer, it does not necessarily mean that he or she is highly satisfied with the computer.

Moreover, most of the previous studies tend to focus on the output of the system by discussing the information produced and its importance in supporting decision-making tasks. For example, the effectiveness of AIS commonly refers to the quality of its output (i.e. information) by prior researchers (Dehghanzade et al., 2011; Kouser et al., 2011; Nicolaou, 2000). Naturally, the ultimate goal of the system is to provide useful information to be used in the decision-making process. Thus, many studies tend to assess the system's effectiveness based on its output, ignoring the importance of its outcome (i.e. benefit). Besides, the scope of AIS users that are

examined or who participated in previous researches is often not clearly defined according to their level, tasks and usage towards the AIS. Nowadays, especially for big organisations that have more structured functions, a lack of definition of the system's users may lead to mixed findings among studies in this field. Logically, user requirements and needs from the system are different depending on their level and the task that they are assigned. Not all system's users are the users of information, nor the decision-maker (Chalu, 2012). Thus, the effectiveness of the AIS should not be just based on the system's output. The overall effectiveness of the AIS should also consider the outcomes, such as benefits from the system.

On the other hand, current technology is said to not be efficient enough to respond to the concerns and challenges in the accounting domain (Belfo and Trigo, 2013). As a consequence, fraud and corruption are still a common problem. Practically, developed system is an organisation may not always bring the benefits wanted (Cohen et al., 2007), even if it is widely accepted within an organisation (Ives and Olson, 1981). This is probably because its use is mandatory or the user has no other choices. However, blame should not be placed on the technology's performance alone. The advancement of technology and improvement in accounting standards requires accounting personnel to continuously develop and update their knowledge, in order to cope with these changes (Ku Bahador et al., 2012). Nonetheless, the level of knowledge accountants have is insufficient to cater for the advancement of technologies surrounding the accounting world (Ismail and Abidin, 2009). Technically, the effectiveness of the system requires all of its components, such as human, organisation, procedure and technology, to perform effectively.

In a study focusing specifically on accounting systems in the context of Malaysia, undertaken by Ilias et al. (2009), dissatisfaction among the end users of the system within the government sector was discussed. The claim of dissatisfaction indicates the system is ineffective, which was caused by the limitations of a stand-alone system. In response to the need for an effective system, enormous investment to improve the system was made by organisations in both the private and public sectors (Chalu, 2012). In Malaysia, the Government continuously support the advancement in technology and improvements in financial management. This can be seen through various plans and programs. Under the Tenth Malaysia Plan (2011 – 2015), the Government had budgeted approximately 650 million Malaysian Ringgits (approximately GBP120 million) for technology advancement in the government sector (Jabatan Perdana Menteri, 2010). This advancement, which includes AIS, aims for effectiveness and efficiency of operations, as well as minimising task redundancy through an integrated and centralised system (Jabatan Perdana Menteri, 2010).

However, it is not an easy task to design and implement a system that exactly meets users' requirements within the complex operations of government. In the context of the public sector, prior studies asserted that it is difficult to design and implement AIS according to organisational expectations (Chalu, 2012). Moreover, the result of the implemented system is often unsatisfactory as compared to the invested resources (Iskandar, 2015). In most cases, the system failed to deliver its expected benefits (Cohen et al., 2007). These situations may delay the system from reaching stability after being implemented because of major repair work that needs to be done simultaneously. As a system operates through a combination of its

components in an environment with a complex structure surrounding it, the performance of each component may affect the system's performance.

Academically, there are limited studies on the effectiveness of AIS in Malaysia. There are a few studies that focus on Small and Medium-Sized Enterprises (SME) (e.g. Ali et al., 2012; Kharuddin et al., 2010; Ismail and Mat Zin, 2009; Ismail and King, 2007; Ismail and King, 2005b), and computerised accounting systems for the public sector (Ilias and Zainudin, 2013; Ilias et al., 2009). Furthermore, most investigations of AIS effectiveness in prior studies have been conducted using either quantitative or qualitative methods separately. According to Gable (1994), an appropriate combination of methods can enhance the robustness of findings. Given the limited evidence on the study about AIS effectiveness in the government sector, especially in Malaysia, having a combination of methods may improve the understanding about the phenomena of the critical factors of AIS effectiveness.

1.3 BACKGROUND OF THE STUDY

1.3.1 Scope of the Study

This study explores and examines the important factors within the AIS environment that lead to the system's effectiveness for an on-going and stable system. The understanding of the phenomenon was gathered from internal users' opinions and a literature review. In particular, the critical factors of AIS effectiveness were examined and the other important factors within the phenomenon of the critical factors of AIS effectiveness were investigated. The identified factors were further tested through a survey on a larger scale in order to get a broader perspective about the phenomenon of the critical factors of AIS effectiveness.

In addition, specific criteria of an effective system were explored. The effectiveness of the AIS was explored from a general to a specific scope during the fieldwork of this study. The effectiveness was therefore measured based on user satisfaction level towards the identified criteria of an effective AIS. Generally, there are various ways of measuring effectiveness (Chalu, 2012; Melone, 1990). Some studies focus on the technical side (e.g. speed and capacity), the output of the system (e.g. information quality), the process (e.g. implementation and design) and cost-benefit analysis. The AIS effectiveness measurement is commonly adopted or adapted from the information system or management information system field of research, as AIS is a component of these. Furthermore, user satisfaction is said to be one appropriate measure for system effectiveness when evaluating a specific information system (DeLone and McLean, 1992), such as the AIS. In addition, user satisfaction is able to cover multiple dimensions of effectiveness, such as quality, technical features of the system and benefits. Moreover, a user satisfaction measurement implies a particular view of the organisation's operations (Melone, 1990). According to Salehi et al. (2010), an effective AIS is a successful system that is widely used by satisfied users.

Furthermore, the development of the research model in this study is based on a detailed review of previous studies and findings from the qualitative fieldwork conducted through group discussions, an observation and semi-structured interviews. In particular, information system and technology evaluation models that were introduced and modified in prior studies are referred to, accordingly: DeLone and McLean Information System Success Model (hereinafter referred to as D&M IS Success Model) by DeLone and McLean (1992), and later extended by Pitt et al.

(1995), respecified and extended by Seddon (1997) and de Guinea et al. (2005), and modified by Gable et al. (2003) and Ifinedo and Nahar (2006); and Technology Acceptance Model (TAM) by Davis (1985). In addition, specific user satisfaction measurements are reviewed, adopted and adapted for the development of the survey questionnaire. On the other hand, previous studies about the determinants of success and effectiveness, as well as its measurement in the context of AIS, Enterprise Resource Planning (ERP), information system and technology from various aspects, such as implementation, project, adoption and current practice, are reviewed thoroughly. Furthermore, the survey questionnaire was implemented on a larger scale of respondents.

Overall, this study focuses on the on-going and stable system, rather than early implementation of the system or for a one-off project. The upcoming upgraded system will use the same software with the latest version and changes in accounting treatment (i.e. from cash-based accounting to accrual-based accounting). Thus, the findings of this study are hoped to make recommendations about how to achieve and sustain effectiveness, rather than just accomplish system success. In addition, the recommendations from this study can be referred to by the Government as preparation for the upcoming system in terms of accelerating the achievement of AIS effectiveness.

1.3.2 Context of the Study

This study focuses on the Malaysian Federal Government. Both qualitative and quantitative data are collected from Malaysian Federal Government organisations,

with a specific focus on the Accountant General's Department (AGD), accounting offices of the Malaysian ministries and its respective responsibility centres.

i. The Malaysian Federal Government

The Malaysian government is comprised of three tiers, which are federal government, state government and local authorities. Specifically, there are six main components, as follows: Federal Government; State Government; Local Government (including Town, District Councils and City Halls); Federal Statutory Body; State Statutory Body; and Islamic Council Malaysia. These organisations are governed by various laws and regulations, depending on their nature and background. The governing laws and regulations are the Federal Constitution, Financial Procedure Act 1957, Treasury Instructions, Treasury Circulars, Accountant General's Department Circulars and particular acts to the agency. In addition, there are also government agencies and Government Link Companies (GLC) that are incorporated under particular acts, such as the Companies Act, 1967, where the Government has a controlling stake over these organisations.

The Federal Government of Malaysia consists of 24 ministries and the Prime Minister's Department. Most of the Government's ministries are located at the Federal Government Administrative Centre in Putrajaya Federal Territory of Malaysia. There are only three ministries that are located at Kuala Lumpur Federal Territory of Malaysia, which are Ministry of Works, Ministry of Defence and Ministry of International Trade and Industry.

Viewed from the Government's accounting structure, each ministry and the Prime Minister's Department comprise of departments, commissions, statutory

bodies and government agencies. Each ministry and the Prime Minister's Department have its own accounting division (also known as accounting office) to manage their accounting matters. The accounting offices are supported by their respective responsibility centres that are located throughout the country. In addition, some departments under some ministries have their own accounting office due for specific reasons, such as their size and function. The accounting offices were given an authority as a Self-Accounting Department (SAD) by the AGD to serve their respective ministries or departments. The accounting office reports to the AGD. On the other hand, the responsibility centre reports to its respective accounting office. Overall, the accounting operations for the Government are managed and monitored by the AGD.

Prior to 2013, there were only 11 accounting offices that belonged to 10 big ministries and the Royal Malaysian Customs Department[1]. The accounting functions for the remaining ministries were performed by the AGD. From 2013, the remaining ministries were given an authority, as a SAD, to manage their accounting transactions. The appointment of another 15 accounting offices was made as preparation for the transition from modified cash-based accounting to accrual-based accounting, which was supposed to be implemented in 2015[2]. Table 1.1 lists the ministries under the Malaysian Federal Government and it accounting office as of 2016.

[1] The Royal Malaysian Customs Department is under the Ministry of Finance Malaysia that responsible to collect revenue and provide trade facilitation through compliance of related laws and regulations enforced.
Source: http://www.customs.gov.my

[2] The implementation of accrual based accounting was postponed until further notice to be announced by the Government.

Table 1.1: The List of Malaysian Ministries

Ministry and Department	Self-Accounting Department (SAD) or Accounting Office
Prime Minister's Department	Existing SAD
Ministry of Defence	Existing SAD
Ministry of Education	Existing SAD
Ministry of Higher Education[3]	Existing SAD
Ministry of Agriculture and Agro-Based Industry	Existing SAD
Ministry of Home Affairs	Existing SAD
Ministry of Health	Existing SAD
Ministry of Transport	Existing SAD
Ministry of Works	Existing SAD
Ministry of Communications and Multimedia	Existing SAD
Ministry of Finance	Newly Appointed SAD in 2013
- Royal Malaysian Customs Department	Existing SAD
Ministry of Foreign Affairs	Newly Appointed SAD in 2013
Ministry of Science, Technology and Innovation	Newly Appointed SAD in 2013
Ministry of Energy, Green Technology and Water	Newly Appointed SAD in 2013
Ministry of Federal Territory	Newly Appointed SAD in 2013
Ministry of Women, Family and Community Development	Newly Appointed SAD in 2013
Ministry of Plantation Industries and Commodities	Newly Appointed SAD in 2013
Ministry of Domestic Trade, Co-Operatives and Consumerism	Newly Appointed SAD in 2013
Ministry of Youth and Sports	Newly Appointed SAD in 2013
Ministry of Human Resources	Newly Appointed SAD in 2013
Ministry of International Trade and Industry	Newly Appointed SAD in 2013
Ministry of Natural Resources and Environment	Newly Appointed SAD in 2013
Ministry of Rural and Regional Development	Newly Appointed SAD in 2013
Ministry of Urban Wellbeing, Housing and Local Government	Newly Appointed SAD in 2013
Ministry of Tourism and Culture	Newly Appointed SAD in 2013

Source: http://km.anm.gov.my

[3] As of May 2013, the Ministry of Higher Education was merged with the Ministry of Education and became one ministry, the Ministry of Education. However, in July 2015, the Ministry of Higher Education was separated again into a single ministry.
Source: http://www.mohe.gov.my

ii. Financial Reporting of the Malaysian Federal Government

A governmental accounting practice is unique in terms of budget management, compared to the private sector, in which government organisations use code and warrant systems (Ilias et al., 2009). Each organisation in the Government is responsible for preparing and keeping their own accounting records. The records are later retrieved and consolidated by the AGD to produce the consolidated financial reports for the Malaysian Federal Government. The reports are then audited by the National Audit Department on a yearly basis to ensure proper management of public resources (Aziz et al., 2014).

At present, the Malaysian Federal Government is using a modified cash basis[4] to record and prepare their financial report. The financial report is prepared, audited and tabled at the parliament every year as one comprehensive report representing the Federal Government. Each ministry is not required to prepare their full set of financial reports because the Federal Government is considered as one accounting entity. However, some big ministries (i.e. Ministry of Education) do prepare their financial statements for internal purpose. Overall, the financial report for the Federal Government is prepared and consolidated by the AGD.

The government's responsibility is higher than private sector because the government has to deliver both tangible (e.g. allowances, subsidies, grant etc.) and intangible benefits (e.g. services, country development, improvement in education etc.) to their stakeholders (i.e. citizens). These benefits cannot be easily measured. The benefit of today's expenses may only be seen after several months or even years.

[4] Modified cash based accounting recognised transactions and related economic events on a cash basis during the year in which all the receivables and unpaid expenses are taken into account a month after the financial year end.
Source: http://km.anm.gov.my

However, the government's capability and accountability in managing the resources can still be seen through accurate and transparent information. Nevertheless, the complexity and voluminous transactions of the government has added to the challenge faced by management to maintain an appropriate record and provide reports on economic events, as well as manage public money wisely. As such, the development and improvement of technology plays an essential role in assisting the Government in managing a high volume of economic-related transactions (Ilias and Zainudin, 2013). Ilias et al. (2009) asserted that an effective accounting system may be helpful in increasing the organisations' performance, in terms of revenue management, in response to the Government recommendation on self-financing matters.

iii. Accounting Information System of the Malaysian Federal Government

The current accounting system of the Malaysian Federal Government is Government Financial Management Accounting System (GFMAS). Prior to GFMAS implementation, the Malaysian Federal Government used Branch Accounting System (BAS). BAS is a semi manual accounting system in which some accounting tasks (e.g. reconciliation, review, analysis etc.) are done manually before the accounting data is entered into the system. As the volume of accounting transaction increased, there is a need for more sophisticated and automated system to cater the high volume of transactions and improve the accounting processes.

The GFMAS is powered by SAP[5] 4.7 software. This proprietary software is specifically customised for a cash-based accounting. The GFMAS was first launched

[5] SAP is the acronym for System, Application and Products. The system is developed for various functions in ERP, covering a variety of accounting and finance functions.

in 2006 with a big bang implementation at the AGD and then by phases at the ministries and their responsibility centres. The main function of the system is to process and retrieve the accounting data from *eSPKB* and *eTerimaan*, process accounting transactions and produce financial and accounting information (e.g. financial reports). The GFMAS, *eSPKB* and *eTerimaan* are intranet based networks[6] that can be accessed through any computer within the organisation that has the application installed.

eSPKB is a Budget Planning and Control System Electronic that is used to process payment and expenses-related transactions. *eSPKB* has been in place since the year 2000 to control and manage the Federal Government's budget. This system was integrated with Branch Accounting System (BAS) prior to the implementation of GFMAS. *eSPKB* is also developed to integrate with other eGovernment applications such as Human Resources Management Information System (HRMIS), Project Monitoring System and so on. The entered data in *eSPKB* will then be processed and forwarded to GFMAS for further action.

On the other hand, *eTerimaan* is a Standard Collection and Receipting System that processes the Government's collection and accounting records related to revenue. *eTerimaan* was implemented in 2008 to smooth the accounting process, replacing the Government's manual collection system. *eTerimaan* is integrated with GFMAS through *eSPKB.* Both *eSPKB* and *eTerimaan* use the same server and platform. The integration between systems allows reconciliation to be done between the accounting records at responsibility centres and reporting in the accounting office, as well as at the headquarters (i.e the AGD). The main functions of the

[6] 'A network which is accessible only by authorised company members, employees and/or agents' (Boczko, 2012, p. 141).

accounting system are to manage the accounting data and to produce financial statements. The accuracy of data and classification of accounts entered into *eSPKB* and *eTerimaan* are ensured through digital checks and approval in GFMAS at the accounting office.

The government's efforts to continuously support the advancement of technology and improvement of financial management in the public sector can be seen in the Tenth Malaysia Plan (2011 – 2015), in which approximately 650 million in Malaysian Ringgit (approximately GBP120 million) had been estimated for technology advancement (Jabatan Perdana Menteri, 2010). This advancement, which includes AIS, aims to improve operation effectiveness and efficiency, as well as minimising task redundancy through an integrated and centralised system (Jabatan Perdana Menteri, 2010). In addition, in 2011, the Malaysian government had announced the transition from modified cash basis to accrual-based accounting by 2015. However, the transition was postponed until a later date yet to be announced by the Government. According to an email conversation between The Edge Malaysia[7] and the Ministry of Finance, The Edge Malaysia reported that the 'implementation of accrual accounting has yet to take place and is scheduled to happen on a date to be determined after the relevant acts are tabled before Parliament' (The Edge Malaysia, 2015, p. 1). To date, the accounting standards and accounting systems that are used by the Malaysian public sector are shown in Table 1.2.

[7] The Edge Malaysia is the publisher of financial, investment and business publications in Malaysia and Singapore that provide independent and insightful reports for its readers.

Table 1.2: Current Accounting Standards and Accounting Systems Used and Implemented in the Malaysian Public Sector

Components	Accounting Systems	Accounting Standards
Federal Government	• Government Financial and Management Accounting System (GFMAS)	• Government Accounting Standards • International Public Sector Accounting Standards (IPSAS)[8] cash basis
State Government	• State Government's Standard Computerised Accounting System (SPEKS)	
Local Government Statutory Bodies Islamic Councils	• Standard Accounting System for Government Agencies (SAGA)	• Malaysian Accounting Standard Board (MASB) • International Financial Reporting Standards (IFRS) • Private Entity Reporting Standards (PERS) • *Pekeliling Kemajuan Perkhidmatan Awam (PKPA) Bil. 1/2011*[9]

In order to realise the transition, the Government is currently upgrading their accounting system to cater for the modules in accrual accounting. The current accounting system, GFMAS, is customised for cash basis accounting. GFMAS is used at the AGD and the accounting office of each ministry for retrieving and processing accounting transactions to produce valuable information for reporting purposes. Whereas the input of accounting data is carried out at the responsibility centre, using Electronic Budget Control and Planning System (*eSPKB*) to record expense transactions and Standard Collection and Receipting System (*eTerimaan*) to record revenue collection transactions. Moving towards the upcoming system, which

[8] This standard is primarily used for the development of Malaysian Public Sector Accounting Standards (MPSAS) with the permission of International Federation of Accountants (IFAC). The development of MPSAS is one of the Government's efforts to move towards accrual accounting treatment. Two committees were established by the AGD of Malaysia to oversee, adopt, develop and implement the MPSAS. The committees are Government Accounting Standards Advisory Committee (GASAC) and the Accrual Accounting Steering Committee.

[9] This circular provides details guideline for the implementation of Standard Accounting System for Government Agencies (SAGA).

is known as 1 Government Financial and Management Accounting System (1GFMAS), the *eSPKB* and the *eTerimaan* at the responsibility centre will be replaced by 1GFMAS accordingly. This enables the transition from decentralisation with different servers to centralisation with one server between the AGD, the accounting offices and the responsibility centres. 1GFMAS is initially planned to be implemented along with the implementation of accrual accounting. However, it is also postponed until further notice. Having known the fact that 1GFMAS is developed to cater for the transition from cash basis to accrual based accounting, the delay of 1GFMAS could also affect the implementation of accrual accounting.

Overall, the AIS in the Malaysian Federal Government is developed, monitored and maintained by the AGD. The AGD has its own internal expert to manage, maintain and improve the system. The AGD also provides an accounting expert to support the accounting operations for the accounting office and its responsibility centres throughout the country. In addition, the accounting office is also provided with an internal IT expert from its respective ministry. The IT expert of each ministry often provides services that relate to technological issues only. Other accounting and AIS specific matters are handled by the AGD.

iv. Significance of the Context of the Study

The context of the Malaysian Federal Government was chosen due to the role of the Government towards its stakeholders, including the ultimate shareholder which is the citizen. The Government bears a great responsibility to wisely manage public money and provide reports to them. Monsen and Nasi (1998) asserted that monetary process

and accounting context in the Government sector is even more complicated than in the private sector.

In addition to that, public sector reforms over recent decades, caused by the economic crisis, financial issues and a rise of public awareness, have together resulted in the adoption of private sector management practices in public sector organisations, of which the effective use of technology is one (Hamali et al., 2014; Cohen et al., 2007). Therefore, the calls for better fiscal management and transparency in reporting have also put greater pressure on the Government of Malaysia. A significant amount of money has been budgeted for the improvement of technology in order to enhance the AIS of the Government. Currently, the Government is upgrading its accounting system to a centralised system that is able to cater for accrual based accounting treatment. Contracts with external experts amounting to more than 200 million Malaysian Ringgits (approximately GBP37 million) have been confirmed for the project (i.e. upgrading the accounting system). The investment in AIS will be worthwhile if the system can be operated effectively.

Furthermore, there are limited studies conducted in the government sector, especially in Malaysia, on the needs for an effective AIS in today's practice. The complexity of the sector and its non-profit oriented nature make the evaluation tougher. In fact, the Government responsibility towards its stakeholders is even bigger than in private sector or profit oriented organisations.

1.4 SIGNIFICANCE OF THE STUDY

Technology evolution in this era of globalisation has led to a greater demand for effective AIS to support the organisation's management and operations. It has been

widely acknowledged that effective information systems with better use of information lead to better performance (Myers et al., 1997). In addition, the advancement of technology has also created a competitive market, in which an organisation has to ensure its current technology is capable of providing high quality information for better decision-making in order to compete with other competitors (Lim, 2013). As the business world evolves within a high technology environment, effectiveness should be achieved and sustained in order to compete with other organisations. Sustainable effectiveness offers competitive advantages, enabling the organisation to outperform other players in the industry. Thus, investigating the phenomenon of the critical factors of AIS effectiveness is vital in order to optimise the performance of the system.

In fact, previous literature documented mixed results on the factors influencing the AIS effectiveness. According to Thong and Yap (1996), factors influencing the information system effectiveness may vary between organisations. Besides, today's factors influencing the system effectiveness may also vary from the past due to revolution in the technology and increased demand, as well as awareness on the usefulness of information in today's practices. In addition, the variety of factors may also be caused by the different nature of the organisation and people's perceptions towards the critical factors influencing the systems. Gathering the determinants of AIS effectiveness remains important to most organisations (Chalu, 2012). Logically, there are always similar factors of AIS effectiveness among successful organisations that can be adopted by others regardless of their sector. Therefore, it is important to explore the phenomenon of the critical factors of AIS effectiveness by considering all the components surrounding the system.

Moreover, the measurement of AIS effectiveness varies among studies because of its multidimensional concepts. There is a lack of clear standards for the measurement of the system effectiveness (Chalu, 2012; Dehghanzade et al., 2011). Prior studies used several constructs to measure the system's effectiveness; most refer to the effective role of the system in providing information to support the decision-making task (Chalu, 2012). Some other studies specifically apply data quality measurement as a proxy for effectiveness. However, this approach does not consider the role of the system in assisting its users to perform their task. On the other hand, several researchers applied an information system *success model*, the benefits of AIS, user satisfaction, impact, system usage and overall effectiveness, to examine the system's effectiveness. Specifically focusing only on user satisfaction towards the information quality assumes that the measurement ignores the presence of other users who are not involved in decision-making (Chalu, 2012). As such, this study intends to fill these gaps by exploring the relevant criteria of AIS effectiveness, particularly the criteria that satisfy the users, whilst at the same time considering the data quality criteria to be put together as a comprehensive measurement for the system effectiveness, based on a user satisfaction approach.

In addition, most prior studies that use user satisfaction as a surrogate for effectiveness do not measure the degree of user satisfaction, in which the measurement of satisfaction is rated using a Likert scale, from *disagree* to *agree*, or *never* to *always*, except for several studies such as Kettinger and Lee (1994), and Al-Maskari and Sanderson (2010). However, these studies focus on general criteria of satisfaction such as overall satisfaction and enjoyment of the system, or focus only on one or two criteria for effectiveness, such as information quality and benefit.

Rating the scale from *disagree* to *agree* does not fully represent the degree of satisfaction. According to Myers et al. (1997, p. 15), 'reliable measurement of user satisfaction requires further study'. Thus, this study intends to examine user's perception of the extent of their satisfaction towards the outputs and outcomes of the system. In addition, a multidimensional concept of user satisfaction in measuring the effectiveness should utilise all the aspects that the users require from an effective system.

Furthermore, modernisation in organisational practice has led to greater pressure on public sector organisations to efficiently manage their resources and improve their performance (Hamali et al., 2014), including their AIS (Chalu, 2012). In response to this, the Malaysian Government has invested heavily in information technology to enhance public sector performance. Logically, the advancement of technology offers more support and benefits towards the organisation's operations. In the context of this study, the application of technology should bring benefits to the accounting process, which subsequently improves organisation performance. Daoud and Triki (2013) asserted the indirect relationship of AIS effectiveness and business performance, in which the adoption of ERP offers support and encourages more accounting techniques to be used. However, sophisticated technology may not be able to satisfy the organisation's needs if its users do not properly operate it (Wiechetek, 2012). The operation of the system should be broadly viewed from all aspects surrounding the system. Many cases reported in prior studies concern the inability of the system to operate as expected (Chalu, 2012; Cohen et al., 2007). Thus, it is important to explore the key components that play a crucial role towards the effectiveness of AIS. Further, it is essential to ensure that Government's efforts

are heading in the right direction in fulfilling the requirements for the system to operate effectively.

Additionally, this study has relevance in filling the research gap on AIS studies in Malaysia. Based on the literature review, most of the prior studies on AIS were focused on Malaysian SMEs, and some other studies were specifically conducted for computerised accounting systems in the context of the Malaysian public sector. Therefore, exploring the AIS in the Malaysian government sector is expected to give more insight about their current practices. Subsequently, the findings from this study can be used by any organisations, not just limited to the Government, to achieve, sustain and improve the effectiveness of their AIS. In addition, the multiple methods applied in this study are expected to elicit richer findings on the relevant critical factors of AIS effectiveness.

1.5 RESEARCH OBJECTIVES

This study investigates the phenomenon of the critical factors of AIS effectiveness including the measurement of AIS effectiveness. The AIS effectiveness in this study is defined as a successfully implemented system that is capable of meeting user's requirements and satisfying them. On the other hand, the critical factors in this study are referred to as important key components, which if properly managed, can lead to the effectiveness of AIS.

Nevertheless, to date, there are numerous ways of measuring the effectiveness of AIS. In addition to that, there have been too many factors identified as having an impact on the effectiveness of the system. The research findings vary according to the context of study (e.g. country, type of organisation, unit of analysis).

Thus, as this study focuses on the Malaysian Federal Government context, it is important to explore and understand the AIS in its current practice. The detailed objectives of this study are as follows;

Objective 1: To explore the criteria of an effective AIS.

Objective 2: To develop a comprehensive measurement of AIS effectiveness.

Objective 3: To investigate the phenomenon of the critical factors of AIS effectiveness.

Objective 4: To examine the relationship between the identified factors within the phenomenon of the critical factors of AIS effectiveness.

Objective 5: To examine the gap between perceived importance and perceived performance of the identified factors within the phenomenon of the critical factors of AIS effectiveness in the Malaysian Federal Government context.

1.6 RESEARCH QUESTIONS

This study addresses five research questions in order to achieve the objectives of this study. The questions are listed as follows;

Research Question 1: What are the criteria of an effective AIS?

Research Question 2: Which of the identified criteria are reliable and valid to measure the AIS effectiveness?

Research Question 3: What are the important factors that lead to an effective AIS? Which of the factors are critically important for the effectiveness of AIS?

Research Question 4: Which of the identified factors are significantly influencing within the phenomenon of the critical factors of AIS effectiveness?

Research Question 5: What is the condition of the gap between perceived importance and perceived performance on the identified factors within the phenomenon of the critical factors of AIS effectiveness in the Malaysian Federal Government?

1.7 OVERVIEW OF THE RESEARCH DESIGN

This study combines qualitative and quantitative methods (i.e. multiple methods) in order to achieve its objectives. Due to limited studies in AIS effectiveness in Malaysia, especially the Government sector, the combination of qualitative and quantitative methods is applied to improve the understanding of the investigated phenomenon. In addition, the uniqueness of the government environment requires in-depth understanding of their operations, especially in accounting processes, functions and the AIS. A summary of the research design of this study is illustrated in Figure 1.1.

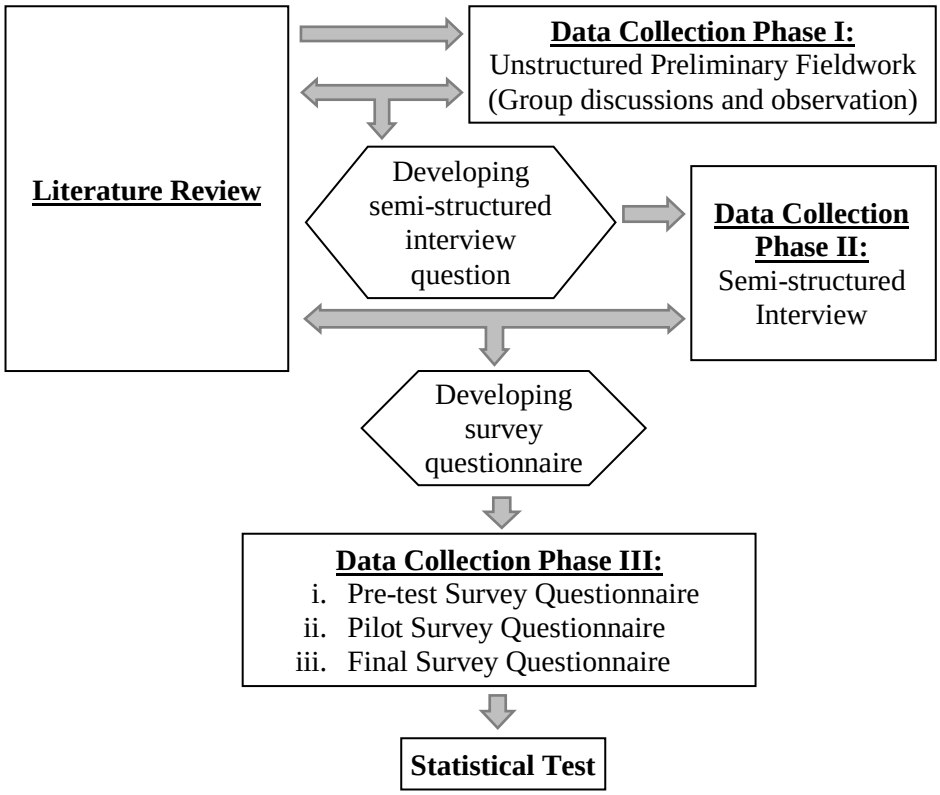


Figure 1.1: A Summary of the Research Design

The data collection for this study comprises of three phases of primary fieldwork research. Phases one and two are based on a small scale, in-depth, qualitative study, whereas phase three is a large scale quantitative study. Prior to data collection for phase one, a detailed literature review on the determinant of system effectiveness and its measurement, including AIS, information systems, information technology, management information systems and ERP, was considered in various contexts, such as implementation, adoption, effectiveness and quality. Based on the literature review, a list of critical factors of AIS effectiveness was drafted. In addition, the related theories, as well as the practice of accounting in the Malaysian Public Sectors, were also reviewed accordingly.

In phase one, which comprises of unstructured preliminary fieldwork, the data was collected based on group discussions and an observation. The fieldwork aimed to gain in-depth understanding of the Government practices related to AIS. It took place at the AGD and accounting division (also known as accounting office) under the Ministry of Finance Malaysia in April and May 2015. This phase provides initial understanding about: AIS practices, accounting operations and information flow in the Government; the factors affecting AIS; and the system's users' opinions towards the system's effectiveness. The understanding and findings from this phase, as well as the findings from the literature review, were comprehensively used in the development of semi-structured interview questions.

Next, phase two of the data collection comprised of semi-structured interviews. The interviews aimed to explore the phenomenon of the critical factors of AIS effectiveness based on the interviewees' opinions towards important factors for the system to operate effectively. On top of that, their perceptions of the definition and criteria for an effective system were discussed. Specifically, their expectations towards the ability of the system to satisfy their requirements were explored to understand the criteria of an effective AIS. The interviews were conducted in August and September 2015 at the accounting office (i.e. ministry level). The findings from semi-structured interviews were used to refine the draft list of the critical factors of AIS effectiveness and the draft list of the criteria of an effective AIS. A proposed research model for the phenomenon of the critical factors of AIS effectiveness was developed and tested on a larger scale, using a structured questionnaire approach.

The survey questionnaire for phase three was constructed based on the qualitative fieldwork findings and instruments from the previous studies. The survey

focused on AIS users who were involved in managing and processing the accounting data into information in the Federal Government of Malaysia. It covers accounting offices at the ministry level and responsibility centres throughout the country. The collected data was then tested accordingly using a statistical approach. Further details of each phase are explained in Chapter 3, section 3.3, page 126.

1.8 THESIS STRUCTURE

This thesis comprises of eight chapters. Chapter 1 explains an overall summary of this research. The issues, research background, research gaps in that exist in the literature, significance of the study, objectives and a summary of the research design are explained accordingly. Chapter 2 comprehensively reviews the literature from AIS, information system, ERP, information technology and other related literature on effectiveness and system success, as well as the important factors influencing the system and its measurement. In addition, the details of the Malaysian Federal Government, the system's users, the components of the system and the measurement for importance versus performance are briefly discussed in Chapter 2. Chapter 3 outlines the research methodology and methods applied in this study. The chapter explains both the qualitative and quantitative methods applied in this study. Chapter 4 explains the implementation and findings of the qualitative part of this study. This includes the unstructured preliminary fieldwork and the semi-structured interviews. Chapter 5 outlines the proposed research model and the operationalisation of variables in this study. Chapter 6, which is the quantitative part of this study, reports the implementation and findings of the quantitative study. Chapter 7 briefly discusses the findings of this study to clearly explain the phenomenon of the critical factors of

AIS effectiveness and fulfil the objectives of this study. Chapter 8 summarises the results of this study and presents the contributions, limitations and suggestions for future study.

1.9 CONCLUSION

This chapter provided the overview of this study. This included a discussion on the issues within the AIS field, background of this study and the significance of conducting the study. In addition, the research objectives and research questions are outlined to make clear the aim of this study. Moreover, this chapter also explained the overview of the research design to give a summary of the overall implementation of the study. In the next chapter, Literature Review, the academic, conceptual and theoretical background related to the scope and context of this study is considered and discussed.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter discusses in detail Accounting Information Systems (AIS) effectiveness in a variety of contexts, such as adoption, implementation, project and effectiveness. The definition of AIS, system users, user satisfaction and various contexts of effectiveness including its determinants, measurement and application in current practice, are reviewed accordingly. In addition, the determinants for effectiveness and success as well as its measurement, for information system, Information Technology (IT) and Enterprise Resource Planning (ERP), are also reviewed in order to get a wider view. Moreover, prior literature on the Malaysian Government that relate to the context of this study is discussed.

2.2 INFORMATION SYSTEMS

Technically, Gelinas et al. (2012, p. 14) defined an information system as 'a man-made system that generally consists of an integrated set of computer-based components and manual components'. The system is built to collect, enter, store, control and manage data and report the processed data in a form of useful information (Gelinas et al., 2012; Romney et al., 1997). The primary objective of an information system is to facilitate operational functions and to provide information for use in the decision-making process (Gelinas et al., 2012). Today, information systems are mostly dependent upon technology. Kaur and Aggrawal (2013) stated that an information system consists of people, structure, technologies and work systems, which are designed according to the organisation's requirements.

Generally, IT is important in improving the effectiveness and efficiency of an organisation's operations (Bach et al., 2011; Mgaya and Kitindi, 2008) in order to survive in a highly competitive environment (Mgaya and Kitindi, 2008). Specifically, Pornpandejwittaya (2012) and Petter et al. (2008) elaborated on the essentials of an information system to support its users in performing their tasks. An information system plays an important role in supporting the organisation's operations (Davis and Olson 1985). It offers competitive advantages and flexibility of business for organisation success (Kaur and Aggrawal, 2013). The optimisation of information system effectiveness requires knowledge and understanding about the system's operations (Bach et al., 2011; Issa-Salwe et al., 2010).

An information system can be considered as a broad area comprised of several specific systems based on function and purpose, such as ERP, Management Information System (MIS), AIS and so on. Some authors refer to AIS as a subsystem of MIS while others consider it to be a subsystem of ERP, depending on the scope of their studies. MIS is a system that has greater capability, in terms of its function, compared to AIS (Hall, 2010). MIS covers a broader context such as sales forecasting, supplier record and analysis etc. Technically, Hall (2010, p. 31) defined ERP as 'an information system model that enables an organisation to automate and integrate its key business processes'. Specifically, Daoud and Triki (2013) discussed ERP as a set of systems that are designed to integrate computer applications, in order to process an organisation's transactions, including its accounting processes. Nowadays, the system that is used to manage the accounting process, known as AIS, offers not just historical accounting information but also accounting information forecasts for control and analysis (Daoud and Triki, 2013). In reality, organisations

may have several stand-alone systems based on the function that they prefer or they may have only one system that offers all the required functions.

2.3 THE APPLICATION OF INFORMATION SYSTEMS IN ACCOUNTING

Accounting is a process of recording, validating, analysing, reporting and communicating financial information to the company's stakeholders. According to the American Institute of Certified Public Accountants (AICPA) (1966), accounting is the part of the information system that presents the information on economic activities in a quantitative form.

Prior to 1960, the inadequate function of technology created doubt among accountants on how secure the information stored in the system was (Pierre et al., 2013). However, as technology grew, a manual accounting system was no longer capable of fulfilling the needs of information for the decision making process in a highly competitive technology era (Brecht and Martin, 1996). Thus, almost all of the organisations in the world moved from a manual accounting system to a more sophisticated system that was based on technology, in order to cope with an increase in business transactions and a high demand for useful information.

It is widely acknowledged that the emergence of various technological tools has created another dimension of opportunity in the accounting world (Tijani and Mohammed, 2013). Mitchell et al. (2000) emphasised the importance of using IT-based accounting systems in order to effectively and efficiently supply accounting information for decision-making. Nowadays, majority of companies in this world apply the function of information technology in their accounting process, which is

known as an AIS. A combination of technology application and accounting process in managing a firm's financial activity has been widely accepted and practised. Furthermore, the revolution of technology has changed the way organisations use the AIS. According to Dandago and Rufai (2014), the emergence of an information system in the accounting process has furnished the accountant with several technological tools, which provide high quality information and solve any related matters. An AIS is designed to simplify the accounting task with a versatile system (Medina et al., 2014) to assist accounting personnel in producing useful accounting information. According to Al-Zwyalif (2013) and Kharuddin et al. (2010), IT plays an important role in enabling the AIS to provide reliable and relevant information that is produced in a timely manner, as required. The information produced by the system covers both historical and forecasting information, which is helpful to the organisation in making better decisions (Daoud and Triki, 2013).

2.4 ACCOUNTING INFORMATION SYSTEM

AIS is 'a system that collects, records, stores and processes data to produce information for decision makers' (Romney and Steinbart, 2006, p. 6). Generally, an AIS is defined as the application of computers and technology in the accounting process to produce financial and accounting information (Pierre et al., 2013; Nicolaou, 2000). Agung (2015) summarised the AIS as an integrated collection of sub-systems and components, of both tangible and intangible form, that work in harmony to perform accounting functions. A study conducted by Dehghanzade et al. (2011) showed AIS to be an element of the organisation that processes financial events into information for use in decision-making. Specifically, Kharuddin et al.

(2010) viewed the AIS as a support system in planning and controlling activities, by delivering reliable and relevant information for the decision-making process. The AIS is designed to assist in the accounting functions, which include collecting data, record keeping and reporting (Belfo and Trigo, 2013; Pierre et al., 2013; Salehi et al., 2010). Belfo and Trigo (2013) and Hall (2010) classified the AIS into three main subsystems: the Daily Transaction Processing System (TPS); the General Ledger and Financial Reporting System (GL/FRS); and the Management Reporting System (MRS). According to Hall (2010);

i. TPS converts daily recurrence economic events into financial transactions and capture it in the system. There are three transaction cycles in TPS, which are the revenue cycle, the expenditure cycle and the conversion cycle (e.g. activity to convert raw materials into products).
ii. GL/FRS are both related to each other. GL processes the summarisation of data from the transaction cycle. On the other hand, FRS produces reports about financial status for internal and external use, such as financial statements.
iii. MRS focuses on providing information for internal use such as budget, cost analysis, profit analysis and so on. The information is produced to assist management in planning, controlling and making decision.

The importance of the AIS to an organisation has been reiterated by many researchers. Ali et al. (2012, p. 296) discussed the AIS as ‘an important enabler to achieve sustainable competitive edge’. The AIS plays an important role in supporting the organisation in: maintaining and engaging with their strategic opportunity

(Ramazani and Allahyari, 2013); recording the organisation's economic activities (Pornpandejwittaya, 2012; Tóth, 2012); and providing useful information for the use in decision-making task (Okab and Al-Oqool, 2014; Al-Zwyalif, 2013; Pierre et al., 2013; Pornpandejwittaya, 2012; Ramazani and Zanjani, 2012; Tóth, 2012; Kharuddin et al., 2010; Sajady et al., 2008). In this globalisation era, it is crucial for an organisation to have the ability to compete, rather than just to survive. The ability to compete refers to an organisation's ability to continuously improve their performance (Salehi et al., 2010). As such, the AIS offers a platform to guide the management team to maximise firm performance through making better and more effective decisions. Having an effective AIS in place allows the accounting and financial information to be produced in a timely manner to support the decision-making process for planning, analysing the organisation's performance (Appiah et al., 2014; Halabi et al., 2010; Sajady et al., 2008), control and coordination (Pierre et al., 2013; Sajady et al., 2008; Mitchell et al., 1997), controlling short-term issues, such as costing and cash flow (Ismail, 2009), monitoring (Sajady et al., 2008), and effectively managing the organisation's business activity (Dalci and Tanis, 2009). In addition, AIS enables accounting tasks to be done more efficiently (Ilias and Zainudin, 2013). Furthermore, the AIS permits the production of various aspects of accounting-related information within a short period (Sacer and Oluic, 2013). However, appropriate operation of the system requires adequate knowledge. Lack of knowledge among the system's users may cause good systems to become ineffective or even troublesome. Mismanagement caused by insufficient knowledge in operating the AIS may lead to several problems, which subsequently result in unproductive and inefficient operations, as well as the loss of data (Dandago and Rufai, 2014).

Prior studies have examined the AIS from the perspective of a contingency model (Nicolaou, 2000), contingency factors (Al-Eqab and Ismail, 2011), the impact on financial reporting (Mark, 2011), data quality (Saleh, 2013; Emeka-Nwokeji, 2012; Xu and Lu, 2003), effective performance measurement (Al-Ramlawy and Kafina, 2011) and repositioning of the AIS (Emeka-Nwokeji, 2012). In Malaysia, there have been a few studies conducted on the AIS, which include those focusing on AIS alignment (Ismail and King, 2007), AIS effectiveness (Ismail, 2009), usage of AIS (Ismail and Mat Zin, 2009), management knowledge of AIS (Sori, 2009) and a continued intention to use AIS (Ali et al., 2012). Most of the studies in Malaysia were conducted for Small and Medium-sized Enterprises (SME). On the other hand, several studies in the public sector were conducted by Chalu (2012) for the Tanzanian context, and by Rahayu (2012) and Komala (2012) for the Indonesian context. Specifically in the Malaysian public sector, studies based on user satisfaction (Ilias and Razak, 2011; Ilias et al., 2009; Ilias et al., 2007) and system usage (Ilias and Zainudin, 2013) were performed in the scope of computerised accounting systems.

2.4.1 Components of Accounting Information System

The AIS plays important roles in managing accounting data through various components and offers an effective way of producing accounting information if properly used. Components of an AIS are the actors, items, parts and elements that work together in making the system operate. The components enable the system to collect, store and process data into information with adequate controls in place (Romney et al., 2013). Viewed from the context of an information system, Picolli

(2012) stated four fundamental components that are needed in order to have a good information system. These are IT, people, process and structure. Picolli (2012) grouped the components into two subsystems, which are technical (i.e. information technology and process) and social (i.e. people and structure). Table 2.1 technically explains the definition of each component.

Table 2.1: The Definition of Information System Components

Subsystem	Component	Definition
Technical	Information technology	'Hardware, software and telecommunication equipment'.
	Process	'The series of steps necessary to complete a business activity'.
Social	People	'Those individuals or groups directly involved in the information system'.
	Structure	'The organisational design (hierarchy, decentralised, loose coupling), reporting (functional, divisional, matrix), and relationships (communication and reward mechanisms) within the information system'.

Source: Picolli (2012, p. 29 & 30)

Specifically focused on the AIS, Saeidi et al. (2014) and Romney et al. (2013) listed six components: people; procedure and instruction; data; software; IT infrastructure; and internal control or security of the system. According to Sacer and Oluic (2013, p. 122), 'AIS consists of hardware, software, people, communication and network, organisation solutions and data'. Taber et al. (2014) narrowed the components into specific factors needed for the AIS to be efficient: human resource; software; hardware; and database. A study by Komala (2012) applied six main components to measure the AIS: software; hardware; brainware; procedure; database; and network communication technology. Overall, the AIS is operated through a combination of people, technology, process and procedure. It has been widely acknowledged that committed users who are competent contribute to the

effectiveness of AIS. However, having a good user is not complete without proper equipment, infrastructure and good organisational environment. Practically, the system will operate within an organisation, meaning it can be influenced by the organisation's characteristics and conditions.

2.4.2 The Users of Accounting Information System

Users of the AIS comprise of internal and external users that either only use information produced by the systems, or are involved in producing information using the system, or both. Summarised from Boczko (2012), the primary internal and external users of AIS are as follows:

i. Internal users – financial accountants, account managers, management accountants, system developers, internal auditors and other departmental managers.

ii. External users – shareholders, external auditors, potential lenders, market regulators, taxation authorities, suppliers, creditors and other interested groups.

A study conducted by Saeidi et al. (2014) showed AIS users to be people who need to use the system, including accountants, consultants, business analysts, auditors, managers and the chief financial officer. Generally, Gable et al. (2003) stated that enterprise system's users range from top executives to data entry operators. Specifically focused on the AIS, Medina et al. (2014) categorised the finance manager, top manager, main accountant and accounting staff as people that make use of the system. In a study about end-user computing satisfaction, the end-user is referred to as a person that directly interacts with the system (Doll and

Torkzadeh, 1988). Similarly, Rai et al. (2002) viewed system's users as the personnel that have authorised access to the system. Sori (2009) classified accounting and finance personnel as the internal users of the AIS, while outside parties that use the information produced by the system are the external users. In a study conducted by Sacer and Oluic (2013) about the impact of IT on accounting processes and its impact on AIS quality, accountants were targeted as respondents for the survey questionnaire. Specifically discussing the role of the accountant in the AIS, Saeidi et al. (2014) asserted that an accountant is responsible for summarising the organisation's transactions and transforming it into useful information to assist the manager in decision-making. In addition, the accountant also plays a role as implementer of the system and is responsible for ensuring the system is being used properly (Saeidi et al., 2014). 'In all cases, accountants use the AIS to perform their functions' (Gelinas et al., 2012, p. 27).

In practice, the accountant interacts with the system to manage and review accounting data, as well as using the information produced by the system for further action to be taken related to the accounting function (Okab and Al-Oqool, 2014). Those who only use the information produced by the system might have less experience with the technical issues and performance of the system, as compared to the users that are involved in processing and producing the information. Dehghanzade et al. (2011) asserted that individual insight concerning the system may vary depending on the way the system is used and the related tasks are completed in order to fulfil their own expectations. Therefore, different users may have different experiences that lead to different perceptions towards the system. Thus, it is crucial to ensure the targeted respondents are capable of responding to the questions

addressed if precise findings are to be sought. An inappropriate mix of users in evaluating the effectiveness of AIS may lead to inaccurate results.

Empirically, different studies have used different types of respondents to represent systems users' in their studies. The targeted respondents depend on the scope of the research; for example, a focus on function, planning, adoption or implementation of the system. Most of these studies are aimed at accounting or finance personnel, ranging from top to lower level management, as respondents. Hall (2010), in discussing the role of the accountant in information systems, mentioned the accountant as a system user, designer and auditor. The accountant as a person that uses the system in performing the accounting functions is mentioned as an internal end-user of the system by Hall (2010). Figure 2.1 illustrates the general model for AIS.

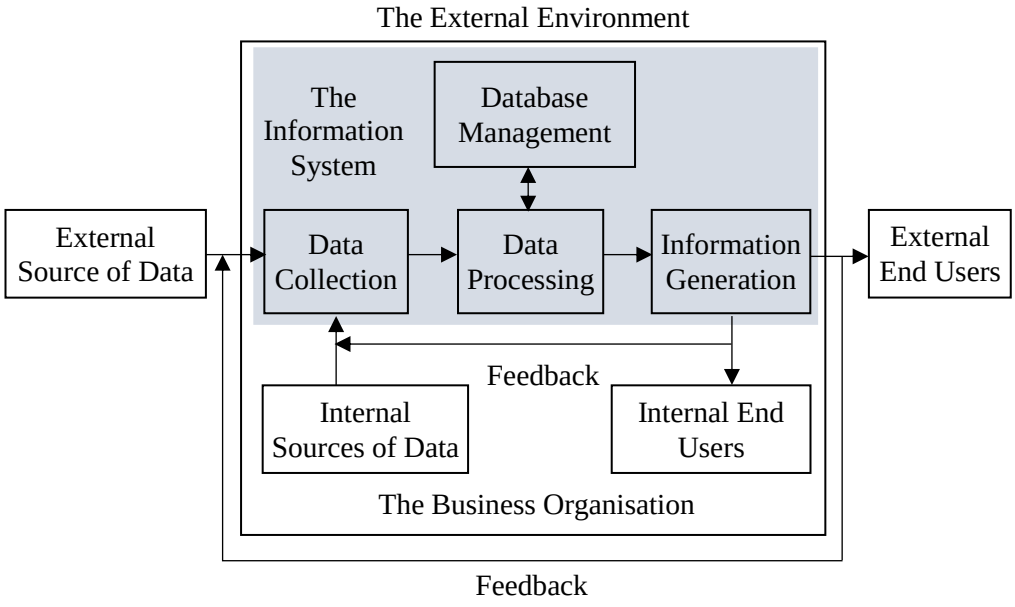


Figure 2.1: General Model for AIS
Source: Hall (2010, p. 11)

Other studies have focused on top level management of an organisation in order to get an overall view of the system. Aimed at the top management level that is highly positioned in making decisions, Nicolaou (2000) investigated the relationship between AIS integration and the perceived effectiveness of the system from the perspective of the financial controller or chief financial officer. A later study conducted by Sajady et al. (2008) distributed a survey questionnaire to finance managers within listed companies at Tehran's Stock Exchange. The study examined AIS effectiveness based on the impact of the system towards decision-making, internal control, financial report quality, performance measures and the financial transaction process. In a paper on smaller organisations, Ismail (2009) studied the implementation of AIS for the Malaysian SME in the manufacturing sector and distributed the study survey questionnaire to the managerial level. As the study was concerned with the implementation of AIS, the manager level is believed to be the most suitable from which to get a response because they are one of the key decision-makers in a SME.

On the other hand, a study about factors influencing AIS quality conducted by Rapina (2014) distributed a research survey on accounting staff of cooperative types of organisation. Focusing on the adoption of computer-based accounting systems, Tijani and Mohammed (2013) investigated finance and accounts executives who were primarily responsible for processing business transactions. Similarly, Dehghanzade et al. (2011) investigated the impact of individual characteristics on AIS effectiveness from the perspective of staff and managers in a finance department who were involved in entering data and reporting. In a broader context of AIS, Awosejo et al. (2013) studied AIS usage, in which their targeted respondents were

employees that primarily used AIS software as part of their job, including accountants. Specifically focused on end-user computing satisfaction in computerised accounting systems, Ilias et al. (2009) aimed their survey at the internal end users of the system, in which most were at the lower level of management in the hierarchy of the Malaysian Government's AIS. A study conducted by Chalu (2012) viewed AIS effectiveness from multiple stakeholders' perspectives, in which the targeted respondents were councillors (i.e. politicians), top management, accounting and IT personnel in accounting and information technology departments. In another study, Taber et al. (2014) focused on academic and top management in research on AIS effectiveness that is conducted in the context Jordanian private higher education institutions.

Overall, the users of AIS are comprised of both internal and external users. The users can be either directly or indirectly interacted with the system. Typically, internal users are the personnel that work closely with the system. In most cases, they are the individuals that are involved in preparing and processing the accounting data into information. These users are primarily represented by accountants in an organisation. They use the system to record, process, manage and produce accounting information for decision makers. Apart from that, there are also internal users that use the system mainly to retrieve information for decision-making. They are often positioned at the top management level. They may have a better opinion, in terms of the quality of information produced by the system, but minimal experience in terms of system operation. On the other hand, external users are often referred to as people outside the organisation that have either direct or indirect contact with the system. Generally, they use the AIS to retrieve information or enter data (e.g.

supplier information) through any other systems that are integrated with the AIS. This type of user may have different expectations and views towards the system when compared to internal users. Therefore, careful consideration must be taken in choosing the right sample for a study of AIS effectiveness. Seddon et al. (1999) suggested the need to have a different measure for different groups of stakeholders in measuring information system effectiveness, in order to reflect the real phenomena of the study.

2.5 ACCOUNTING INFORMATION SYSTEMS IN THE PUBLIC SECTOR

Generally, the main objective of the AIS is to produce accounting and financial information for its stakeholders. Additionally, in the context of the government sector, the system plays an important role in controlling the expenses for each organisation and ensuring they are within the approved budget that is endorsed by politicians (Monsen and Nasi, 1998). The AIS for government is commonly customised in order to cope with the complexity of its structure, transaction and unique nature.

Furthermore, the application and structure of the AIS in every organisation depends on the implemented accounting treatment. For example, a government organisation that implements accrual-based accounting may design and structure its AIS to have a function for assets, accrued accounts, long term liabilities and other related information in the balance sheet. However, for a government organisation that implements cash-based accounting, the AIS is designed and structured primarily for the purpose of monitoring spending and budgeting (Chan et al., 1996). Adopting

and implementing an AIS in the government or a public sector organisation can be considered a big project that needs a large budget, careful consideration, and sufficient resources in terms of expertise and staff, as well as a readiness to change. In most situations, the adoption of a new system in the public sector is decided by top management level. In some cases, middle and lower management level are involved during the planning phase by giving their opinion. However, once the system is implemented, its usage is mandatory. Therefore, the performance of the system's users and the acquired technology should work in parallel in order to gain benefits from the system and achieve its intended objectives.

2.6 ACCOUNTING INFORMATION SYSTEM EFFECTIVENESS

System effectiveness is widely applied as a dependent variable in information system and AIS literature. The topic has been continuously debated among researchers due to its importance towards the organisation, as well as inconsistent results in prior research. The definition of system effectiveness varies from one study to another, depending on the context of the study. As a consequence there are many ways of measuring it, in both the information system and the AIS fields (Chalu, 2012; Hamilton and Chervany, 1981). The measurement differs according to the concepts of measurement, such as qualitative and quantitative aspects, technical, individual or people, organisational and environmental.

Effectiveness is illustrated as a part of success in DeLone and McLean's Information System Success model (hereinafter referred to as D&M IS Success Model). The model was introduced in 1992 by DeLone and McLean to measure information system success. Success in D&M IS Success Model is viewed as a

broader concept that comprises of the event, process, influence and effect. Specifically focused on information system implementation and usage, Ajami and Mohammadi-Bertiani (2012) defined success as user acceptance and continued use of the system. On the other hand, the effectiveness is viewed as the effect of success in the D&M IS Success Model.

Generally, an information system is said to be effective when it is capable of accomplishing its objectives (Hamilton and Chervany, 1981), achieving organisational goals (Raymond, 1990), supporting decision-making tasks (Thong and Yap, 1996) and enhancing organisational performance in terms of activity, process and outcomes (Gatian, 1994). These studies emphasised effectiveness in terms of contribution towards achieving targets and improving performance. The effectiveness of the information system has been variously discussed from the perspective of benefit, performance, budget, standards, quality and support to organisational operations and practices. It should be remembered that a successful system might not always be effective. But, appropriate management and use of the successful system will lead to system effectiveness.

In the context of AIS, the definition of system effectiveness has been studied and discussed in specific contexts. For example AIS effectiveness is defined as the decision makers' perception of the ability of the system to provide information that meets their requirements for coordination and control purpose (Kouser et al., 2011; Nicolaou, 2000). This can bring benefits to the system's users and the organisation in terms of operation improvements (Sajady et al., 2008) and better decision-making (Kouser et al., 2011). According to Salehi et al. (2010), AIS effectiveness refers to successfully applied systems that meet users' requirements. Adapting the definition

of Nicolaou (2000), Dehghanzade et al. (2011) take further consideration in their measurement by taking into account the capacity of the system in providing the expected information, considering the relevant legal obligations, preparing financial reports and providing adequate control structures in order to meet decision makers' requirements. A study by Chalu (2012) viewed AIS effectiveness as a multidimensional construct by taking into account four dimensions, including accounting information quality, system quality, user satisfaction and organisational performance. Another study conducted by Pornpandejwittaya (2012) specifically defined the effectiveness of the AIS based on the features of information quality. The features are reliability, relevance and timeliness. These definitions are more likely to focus on the role of the AIS in providing information for its users. Theoretically, a good decision requires a substantial amount of high quality information. However, not all AIS users are using the system to retrieve information for decision making (Chalu, 2012). It is reliant on the level of the user. For example, low level management, such as accounting clerks, may only use the system to do the initial entry of data. On the other hand, top level management might not be involved in recording the data but they retrieve the processed information for use in decision-making.

Ideally, effectiveness should not just be achieved but also maintained. Previous studies reported a positive association between information system effectiveness and firm performance (Myers et al., 1997). Therefore, on top of rapid changes in technology and an increase in demand for high quality information, it is very important for an organisation to maintain its system effectiveness, in order to compete in this era of globalisation. Maintaining system effectiveness requires

capability of all related components (e.g. people, machine, organisation and rules) to deliver the best performance possible.

2.6.1 Measurement of Effectiveness and Success

It has been more than four decades since the 1970s, when system measurement shifted its focus from efficiency to effectiveness (Myers et al., 1997). During this period, more assessments had been done, including from the perspective of system outcomes rather than just outputs. While efficiency focuses on the output (e.g. the number of reports completed on time), effectiveness emphasises the outcome or impact from the system (e.g. improved productivity of the system's user). Nevertheless, measuring system overall outcomes can be impossible because it comprises of both tangible and intangible, or financial and non-financial, aspects. According to Iskandar (2015), AIS effectiveness can be measured according to the capability of the system in achieving its intended purpose. Primarily, the purpose of the AIS is to produce useful information to support the decision-making process. Nevertheless, the intended purpose of the system may vary from one stage or function to another. For example, the purpose of the input process is to capture and store the data. Whereas, the purpose of the processing stage is to manage, review and transform the data into information. Thus, while the effectiveness of AIS during the input process stage is seen when the system is able to capture the related data, the effectiveness of AIS during the processing stage is when the system is being useful and helpful in the process of managing and transforming the data into information. Moreover, neither the information system nor the AIS refers to one piece of software or a single application; the system may consist of several related pieces of software

and applications. The importance of financial measures for the system's success or effectiveness has been acknowledged in prior studies. Yet, dealing with impacts and benefits of the system, non-financial measures should not be ignored (Gable et al., 2003). Seddon (1997, p. 248) conceptualised information system success as 'a value judgement made by an individual, from the point of view of some stakeholder'. Adapting that concept into effectiveness measurement, opinion requires knowledge, experience and information about the system in order to give good judgement on the system's effectiveness.

Discussing the measurement of effectiveness also requires an understanding of how to evaluate success. In fact, most of the prior studies of information systems and AIS adopted or adapted the evaluation of system success in measuring system effectiveness. In addition, the development of information systems or AIS success and effectiveness measurement is also referred to in other fields of study, such as communication, organisational effectiveness and information. The next sub-sections discuss the fundamental contexts and models of system success and effectiveness that have been widely referred to by other researchers in information system and AIS fields.

i. *Organisational Effectiveness*

In the context of organisational effectiveness, Cameron (1980) asserted that the evaluation of effectiveness should be outlined with specific criteria because effectiveness represents a broad context of achievement. Cameron (1980) highlighted several issues behind effectiveness measurement, such as self-interest, tradition and after-the-fact judgement that lead to bias in the assessment. Amongst the issues,

Cameron (1980) asserted that after-the-fact judgement may narrow down the effectiveness perspective into short term achievement, rather than long term organisation survival. The after-the-fact judgement refers to effectiveness evaluation that is based on the 'criteria that justify what they have already done' Cameron (1980, p. 67). Overall, there are four major approaches used to evaluate effectiveness, as discussed by Cameron (1980) in the context of organisational effectiveness. The approaches are summarised as follows:

i. The performance in achieving organisational goals.
ii. The degree of organisation's needs in acquiring resources from its external environment.
iii. Organisational operation and internal process.
iv. The satisfaction of strategic constituency[1].

Among these four approaches, none is appropriate in all situations or all types of organisation (Cameron, 1980). Given the subjective definition of effectiveness, organisations may or may not be effective even if any of the approaches are fulfilled. For example, the achievement of an organisational goal can also be reached by an ineffective organisation, or vice versa, depending upon the goal set and the organisation's ability. Any approach can be used either individually or in combination, except for certain circumstances of the organisation that are referred to as *organised anarchy*. Some of the characteristics of o*rganised anarchy* as outlined by Cameron (1980) are summarised as follows:

[1] 'Any group of individual who have some stake in the organisation ... those whose lives are significantly affected by the organisation' (Cameron, 1980, p.67)

i. Poorly defined goals.

ii. The connection between means (work done) and ends (outcome) is not clear.

iii. Redundant and poor defined strategy that do not significantly improve the performance.

iv. Poor feedback along the process of operation

v. Poor connection between subunits that commonly limit any influence from the external environment.

vi. Various criteria of success within the organisation.

vii. Poor connection between organisational structure and its activities.

The selection of approaches depends on the availability and stability of organisation-related information to serve the selected approach, as well as the purpose and context of the effectiveness to be assessed. Specific focus on the concept of effectiveness should be precisely defined in order to get a meaningful evaluation. As such, Cameron (1980) suggested six critical questions in examining the effectiveness, which Cameron and Whetton (1983) later expanded into the seven guidelines as shown in Table 2.2.

Table 2.2: The Seven Guidelines in Evaluating Organisational Effectiveness

	Guideline
i.	From whose perspective is effectiveness being judged?
ii.	On what domains of activity is the judgment focused?
iii.	What level of analysis is used?
iv.	What is the purpose of the assessment?
v.	What time frame is employed?
vi.	What type of data are sought?
vii.	What is the referent against which effectiveness is judged?

Source: Cameron and Whetton (1983) in Cameron (1986, p. 93 & 94)

The seven guidelines of Cameron and Whetton (1983) have been widely discussed by other researchers in the information system field (e.g. Chang and King, 2005; Sedera et al., 2004; Seddon et al., 1999; Myers et al., 1997). The guidelines are useful as a basis for developing system effectiveness or success measurement (Chang and King, 2005; Seddon et al., 1999; Myers et al., 1997).

ii. *Information System Success Model*

In the context of information systems, the D&M IS Success Model is one of the most popular information system success models used by prior researchers in measuring system success and system effectiveness. The D&M IS Success Model was developed by DeLone and McClean (1992) by referring to prior research frameworks proposed by Shannon and Weaver (1949) and Mason (1978). These frameworks are based on a theory of communication and a theory of information, respectively. The D&M IS Success Model was drawn according to a series of stages in information flows from the production to the use of information in the communication process. The model is considered to be a comprehensive model that combines causal and process interrelation between dimensions. See Figure 2.2 for the original D&M IS Success Model published in 1992. The model proposed six interdependent dimensions, illustrating a process and causal model of information system success. The six dimensions are system quality, information quality, use, user satisfaction, individual impact and organisational impact. Apart from being widely referenced and applied by other researchers, the model has also been challenged and criticised.

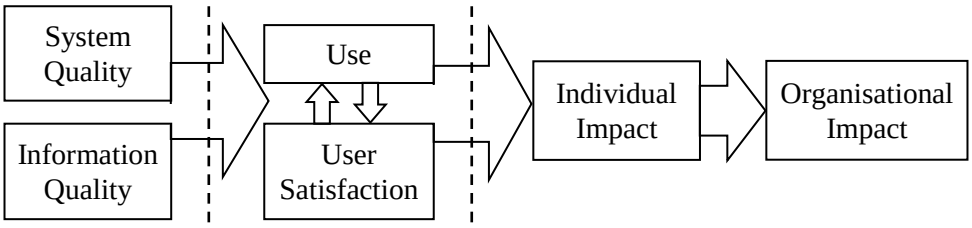


Figure 2.2: D&M IS Success Model
Source: DeLone and McClean (1992, p. 87)

A study of information system effectiveness conducted by Pitt et al. (1995) proposed an augmentation on the D&M IS Success Model as shown in Figure 2.3. The proposed augmented model adapts the original D&M IS Success Model with additional constructs that reflect the role of the information system department in providing serviced to its users (e.g. problem solving and responding to any request related to the system). The proposed service quality dimension was adapted from the marketing field in assessing service quality (Pitt et al., 1995).

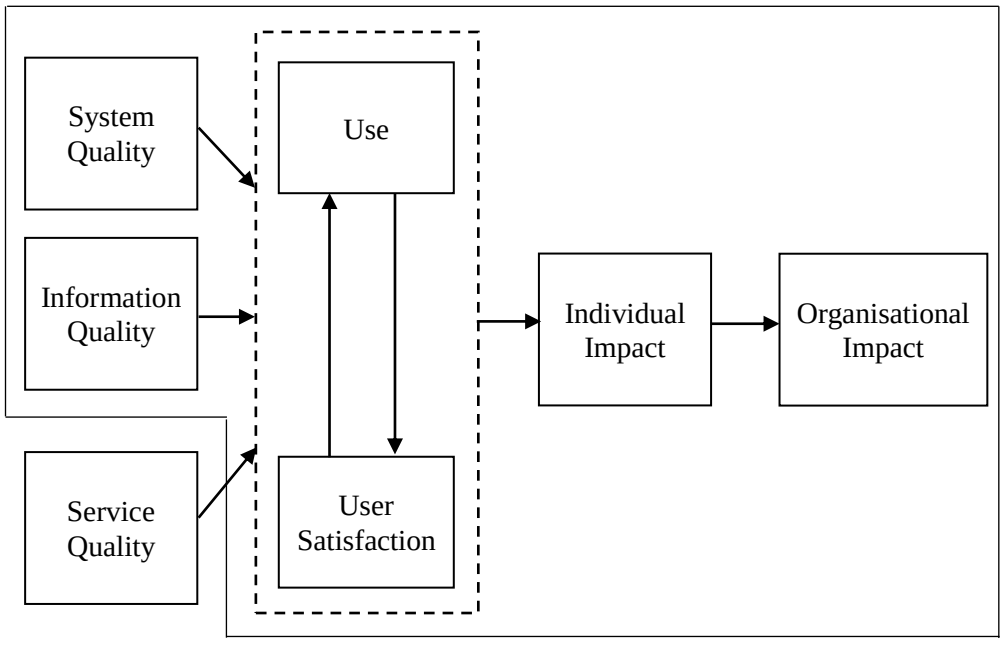


Figure 2.3: Augmented IS Success Model Adapted from DeLone and McLean (1992)
Source: Pitt et al. (1995, p. 175)

The service quality in the augmented IS success model is evaluated based on five dimensions in the context of information systems, which are tangible, reliability, responsiveness, assurance and empathy. Table 2.3 explains the details of the five dimensions.

Table 2.3: Five Dimensions of Service Quality Evaluation

Dimension	Example in the Context of Information System
Tangibles	Physical facilities, equipment and appearance of personnel.
Reliability	Ability to perform the promised service dependably and accurately.
Responsiveness	Willingness to help customers and provide prompt service.
Assurance	Knowledge and courtesy of employees and their ability to inspire trust and confidence.
Emphaty	Caring, individualized attention the service provider gives its customers.

Source: Pitt et al. (1995, p. 177)

However, as discussed earlier, due to multidimensional constructs in measuring effectiveness, some of the dimensions of service quality lead to, rather than represent, effectiveness. For example, having up-to-date hardware and software, which is considered as a tangible dimension in measuring service quality, is actually a factor that is needed in order to achieve system effectiveness. Pitt et al. (1995) also mention the importance of the information system department in giving support to the system's users as a factor that satisfies the users. In the technical context of information technology, furthermore, Seddon (1997) mentioned that careful consideration should be taken in order to use service quality instruments. This is because if the information system is defined as various applications of information technology, the information system department is not a type of information technology application. As Pitt et al. (1995) assessed system effectiveness based on

the role of the information system department, the use of a service quality instrument is appropriate in the context of their study.

The work of Pitt et al. (1995) is supported by Myers et al. (1997) and later updated by DeLone and McLean (2003) in their updated model. In addition, Myers et al. (1997) added *Work Group Impact* on top of the existing dimensions in D&M IS Success Model and *Service Quality* dimension in that proposed by Pitt et al. (1995). The importance of work groups was discussed by Myer et al. (1997) as an intermediate of information system impact between the individual and the organisation. Practically, an organisation allocates each of its operations to departments, divisions or units. Commonly the departments, division or units will have their own vision and mission to be achieved, for which teamwork is required. Thus, the outcome of the information system cannot be realised by just one individual's work; it requires an accumulated workgroup effort. Figure 2.4 illustrates the comprehensive IS Assessment Model that considers the internal and external environments for selecting the measures.

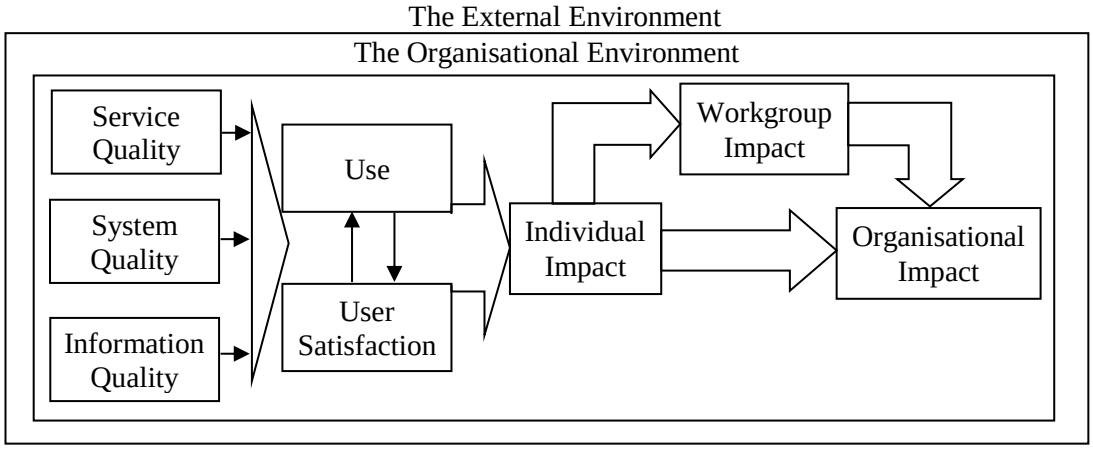
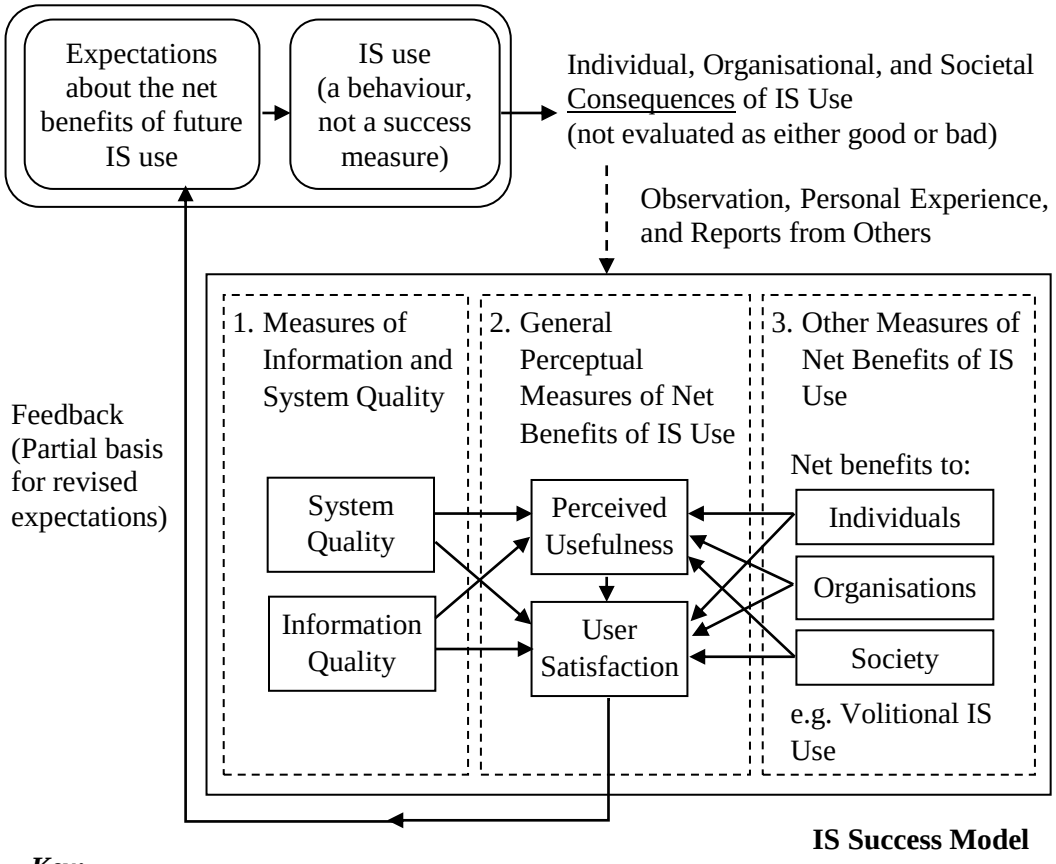


Figure 2.4: A Comprehensive, IS Assessment Model and Contingency Theory (Selecting the Measures)
Source: Myers et al. (1997, p. 18)

A later study that referred to the D&M IS Success Model was conducted by Seddon (1997). Seddon (1997) criticised the combination of process and causal explanation in the D&M IS Success Model for potentially causing confusion (Seddon, 1997). These criticisms were addressed by DeLone and McLean (2003) in their update of the D&M IS Success Model. However, without denying the fact that the model can be confusing, they stressed the need to fully understand the process and impact of the system through three components, which are 'the creation of a system, the use of the system and the consequences of this system use' (DeLone and McLean, 2003, p. 16). Seddon (1997) added that it is not possible to combine both process and causal model as they are explaining different phenomena. 'If one does, there must be a slippage of meanings somewhere in between' (Seddon, 1997, p. 242).

In addition, Seddon (1997) has also argued that the *Use* dimension presented in the D&M IS Success Model is not suitable for measuring information system success, especially for the case of mandatory use (Daoud and Triki, 2013; Seddon, 1997). Seddon (1997) further debated the inappropriateness of the *Use* dimension being included in the model due to the reason that *Use* (e.g. number of hours, number of users and frequency of use) acts as a proxy for the benefits of use; system success is more appropriately measured by its benefits. On the other hand, from the perspective of a process model, '*Use* is necessary but not sufficient to cause impacts' (Seddon, 1997, p. 248). In an effort to eliminate the confusion in the D&M IS Success Model, Seddon (1997) proposed a respecification and extension of the D&M IS Success Model. In the model, *Use, User Satisfaction, Individual and Organisational Impact* were grouped under *net benefit of information system use*.

The model eliminates the process model present in the D&M IS Success Model and splits it into two variance models as shown in Figure 2.5.



Key:

Rectangular boxes	IS Success model
Rounded boxes	Partial behavioural model of IS Use
Solid-line arrows	Independent (necessary and sufficient) causality
Dotted-line arrow	Influence (not causal, since observer's goals are unknown)

Figure 2.5: Respecified Version of DeLone and McLean's (1992) Model of IS Success

Source: Seddon (1997, p. 245)

Nevertheless, DeLone and McLean (2003) disagreed with the argument on *Use* because the measurement of *Use* should be viewed from the wider context of usage (e.g. from basic to advanced, nature, quality) rather than simply defining it as an amount of time spent using the system. They added that 'no system use is totally mandatory' (DeLone and McLean, 2003, p. 16). Given the complexity and

multidimensionality of system use, there is always room for voluntary use, such as to fully utilise the system's functions in order to gain more benefit from it. For example, one of the purposes of online submission is to smooth and speed up the reporting process. But if top management still think that hard copy submission is needed (on top of the online submission) for documentation purposes, the system even has the ability to capture the date of submission and save the report. In this case, ineffective use of the system causes task redundancy, thereby reflecting the ineffectiveness of the system. However, if the system's functions are fully utilised for the intended purpose, the benefit of speeding up the accounting process in a systematic manner can be realised.

On the other hand, the context of *Use* can also depend on the unit of analysis of the study and the domain of activities being investigated. In an example given by Rai et al. (2002), some employees use the system to generate the information needed while others use the system as part of their task, suggesting a correlational rather than causal relationship between perceived usefulness and *Use*. In other words, different levels of management may have a different domain of activities as well as different intentions towards the system. Having a different purpose in using the system offers various context of *Use*. For example, if the unit of analysis is a high level of management, *Use* can be measured based on how many system applications (e.g. office support systems, decision support systems, accounting-based applications) are implemented by the organisation, because they understand the importance of each system and they are using the systems to support decision-making tasks. On the other hand, if the unit of analysis is a lower level of management, *Use* can be measured based on how effective the system is by assessing their satisfaction, perceived benefit

and number of hours spent per day. This is because they are more concerned about how the system assists them in completing their routine tasks instead of the overall functions of the system towards the organisation. As the D&M IS Success Model promotes a multidimensional construct of information system success, restricting the *Use* dimension to a specific context, such as benefits (as suggested by Seddon, 1997) may eliminate the richness of the multidimensional concept in the model. DeLone and McLean believed that the respecified model of Seddon (1997) is even more complicated. However, considering the argument about *Use* as behaviour, DeLone and McLean (2003), therefore, proposed *Intention to Use,* which represents attitude, and retained *Use*, which represents behaviour, in their updated D&M IS Success Model.

Additionally, DeLone and McLean (2003) combined individual and organisational impact into one dimension, which is *Net Benefit*. This refinement has improved the definition of that dimension to better fit into the success model. The previous dimension, named as impact, can result in both good and bad impacts in which bad impacts are commonly related to unsuccessful criteria. The application of the *Net Benefit* dimension poses three questions: 'what qualifies as a "benefit"; for whom; and at what level of analysis' (DeLone and McLean, 2003, p. 22).

Moreover, in response to Pitt et al. (1995), DeLone and McLean (2003) agreed with the shift in the information system role from that of system developer to service provider. This led to *Service Quality* being added to the updated D&M IS Success Model. This change was made in order to recognise the evolution of the information system impact from a specific group of users to a broader perspective. Figure 2.6 shows the updated D&M IS Success Model.

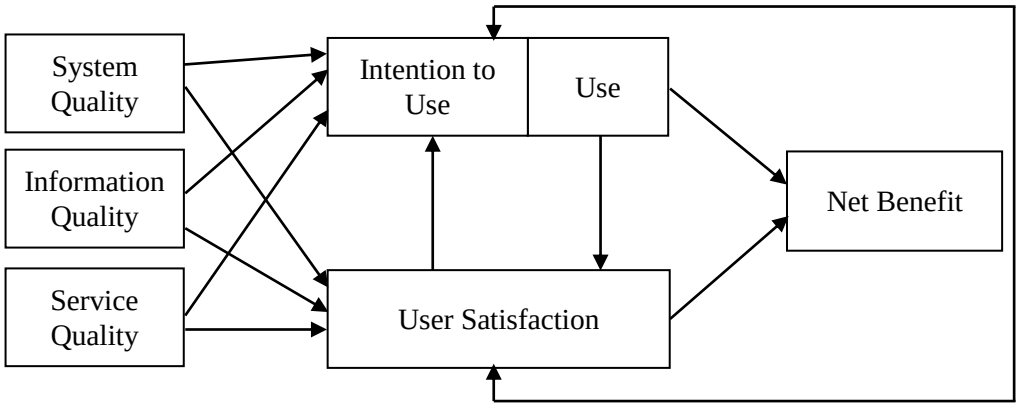


Figure 2.6: Updated D&M IS Success Model
Source: DeLone and McLean (2003, p. 24)

With reference to the original D&M IS Success Model, Gable et al. (2003) reformulated the information system success model for an ERP context by taking into account the information success model developed by DeLone and McLean (1992) and Myers et al. (1997). Gable et al. (2003) undertook an exploratory and confirmatory study in order to reformulate the model for the ERP context. The model by Gable et al. (2003) is shown in Figure 2.7. Satisfaction in this model is 'treated as an overall measure of success, rather than as a dimension of success' (Gable et al., 2003, p. 586). A seven-point Likert-scale, from *strongly disagree* to *strongly agree* was used to evaluate the dimensions.

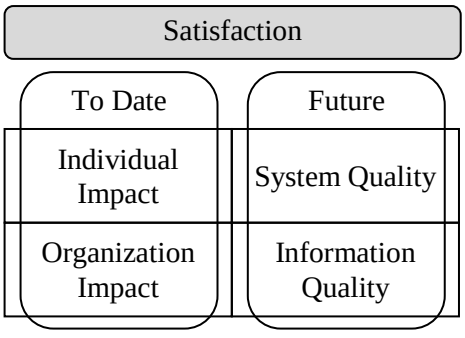


Figure 2.7: The Revised Model of Enterprise System Success
Source: Gable et al. (2003, p. 586)

The enterprise system success model developed by Gable et al. (2003) implies the suitability of the model to be used at all levels of the organisation. However, in practice, there is always a group of users that use the system only to key in data, and have that as their daily routine (Chalu, 2012). These users are less likely to seek quality from the information produced by the system because their main concern is to key in the data. Thus, their perception of the quality of information produced by the system might be limited to certain contexts only. As such, measuring their perception of information quality as one of the constructs might not be suitable for this group of user.

A later study, conducted by Ifinedo (2006), extended the revised model of ERP by Gable et al. (2003). The extended model is shown in Figure 2.8. The model proposed six dimensions of ERP system success, incorporating Gable et al.'s (2003) revised model and workgroup impact that was proposed earlier by Myers et al. (1997), in their comprehensive model of information system assessment. A vendor/consultant quality dimension was added into the ERP system success model. Despite several arguments about vendor/consultant quality being an exogenous factor of system success, the model considered it to be one of the success dimensions due to its importance in contributing towards the success of the system (Ifinedo, 2006). A further study conducted by Ifinedo and Nahar (2006) found that the vendor/consultant is crucial to the success of an ERP, based on the system's users' opinion.

Furthermore, Bach et al. (2011) proposed an extension to the updated D&M IS Success model by suggesting *User Feedback* and *Technology Partner* as additional dimensions in the success model. *User Feedback* is assessed on the basis

of needs, usefulness, satisfaction over time and response time to change. On the other hand, *Technology Partner* is indicated by expertise, technology features and infrastructure.

Figure 2.8: The Extended ERP Systems Success Measurement Model
Source: Ifinedo (2006, p. 21)

Generally, the system success models developed and modified by prior researchers (e.g. DeLone and McLean, 1992, 2003; Gable et al., 2003) have been referred to by other researchers to measure system success or effectiveness, of which the system success or effectiveness is commonly treated as a dependent variable. Thong et al. (1994) applied some of the dimensions of the D&M IS Success model, including user satisfaction, system usage, application impact and organisational impact. However, in a later study conducted by Thong and Yap (1996), the use of a system usage dimension was contested as its suitability may vary depending on the implementation status of the system (i.e. voluntary versus mandatory). They pointed out that system usage could be an appropriate measure if the system is used voluntarily rather than mandatorily. Besides, effectiveness is also measured in a more general context through overall system effectiveness. The overall system effectiveness measurement is commonly based on the overall perception of the system's users about the system. De Guinea et al. (2005) used two items to measure

overall system effectiveness; namely overall satisfaction of needs and overall satisfaction concerning the system's effectiveness. Furthermore, Garcia-Smith (2007) measures the clinical information system success model based on the system's performance, information quality, social influence, facilitating conditions, use dependency, user satisfaction and net benefit. Specifically focusing on the AIS, Ismail (2009) measures the system's effectiveness according to six dimensions of the D&M IS Success Model introduced in 1992: system quality; information quality; usage of the information; user satisfaction; and positive impact on both the individual and the organisation. Using a similar measurement, Chalu (2012) assessed the effectiveness of AIS based on accounting information quality, system quality, user satisfaction and organisational performance. User satisfaction towards the whole system was applied by Chalu (2012) to control the inherent limitation of mandatory usage.

In spite of the evolution and improvement of the system success models, these models do not clearly differentiate the relationships between the constructs, although the possible causalities between them were acknowledged by DeLone and McLean (1992, 2003) for the D&M IS Success Model. For example, in Gable et al.'s (2003) model, sophistication and ease of use of the system were used to measure system quality as one of the proxies for enterprise system success. In fact, the sophistication of the system may lead to the ease of use feature of the system. The ignorance of causality among constructs in measuring the system success has been mentioned in Gable et al. (2003, p. 582), where the authors state that the constructs 'are posited to be correlated and additive measures of the same multidimensional phenomenon – enterprise system success'. This may be difficult to avoid in

developing a comprehensive measure for system success, as the criteria of the items in the constructs are multidimensional in terms of cause-and-effect between each other. Gable et al. (2003), in the revised model, dropped the satisfaction dimension from the measurement construct, and treated it as an overall measure of success.

Apart from the information system success models that made a reference to D&M IS Success model, another important scope in success measurement related to AIS is Activity-Based Costing (ABC) system success. It has been widely acknowledged that today's AIS is capable to provide not only historical information for recording purpose and financial evaluation performance, but also on-going costing information and forecasting information. High quality of information is highly demanded for a relevance and reliable information in order to identify opportunities for improvement. In a study by Foster and Swenson (1997), they examined alternative measures of ABC management success in several models of ABC management success determinants. Specifically, they listed four types of success measure: the use of ABC management information indecision making; change in decision following the ABC management implementation; dollar improvements resulting from the ABC management implementation; and overall success of ABC management based on management evaluation. Based on statistical result of the study, they found that the explanatory power of ABC management success determinant models is sensitive to the choice of a success measure. In particular, dollar improvement and management evaluation were found to have greater explanatory power of ABC management success determinant model. Foster and Swenson (1997) suggested for the use of specific success measure for more reliable determinants of ABC management success.

Measurement for system success continues to develop over time as the output and outcome from the system is also promising following the improvement in technology. Cinquini and Mitchell (2005) discussed seven types of evidence in assessing ABC management success: participants' opinions of success; system's condition for success; financial benefit of information produced by the system; existence of the information; meeting the system's objectives; improvement on existing information; and use and impact of information produced by the system. Among all of the seven types of evidence in assessing success of ABC management, only financial benefit of information that provide a clear conclusion of success (Cinquini and Mitchell, 2005). The financial benefit of information is viewed in terms of improvement in financial position and overall financial performance. On the other hand, the other six types of evidence were concluded by Cinquini and Mitchell (2005) as less conclusive in assessing ABC management success.

Overall, the information system success model and the measures of ABC system success have served as a platform for the development and evolvement of system success, as well as effectiveness. The constructs in the discussed models and the measures of ABC system success have been applied either fully or partially by prior researchers in measuring system success and effectiveness in their studies.

iii. Model Related to the Acceptance of Technology

Another dimension of technology that should also be considered when evaluating effectiveness is acceptance of the technology. Davis (1985) proposed the Technology Acceptance Model (TAM), which posited that *ease of use* and *usefulness* of the system influence the attitude of the system's user towards actual usage of the system.

This model explains computer usage behaviour with regards to acceptance. The user's beliefs about the system's features and capabilities (i.e. related to *ease of use* and *usefulness*) influence their attitude towards using the system, e.g. about whether to use it or not (accept or reject) (Davis, 1989). The three main factors (i.e. *perceived ease of use*, *perceived usefulness* and *attitude towards using* the system) are classified as motivational factors. *Perceived ease of use* is defined as 'the degree to which a person believes that using a particular system would be free of effort' (Davis 1989, p.320). On the other hand, *perceived usefulness* is defined as 'the degree to which a person believes that using a particular system would enhance his or her job performance' (Davis 1989, p.320). Figure 2.9 illustrates the conceptual framework of technology acceptance and Figure 2.10 presents the TAM.

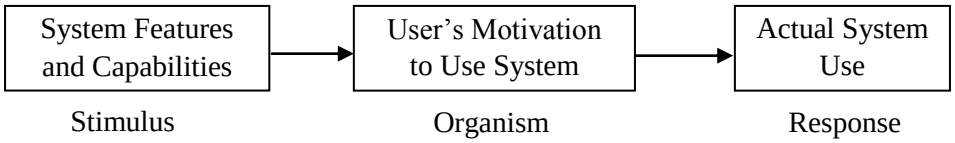


Figure 2.9: Conceptual Framework of Technology Acceptance
Source: Davis (1985, p. 10)

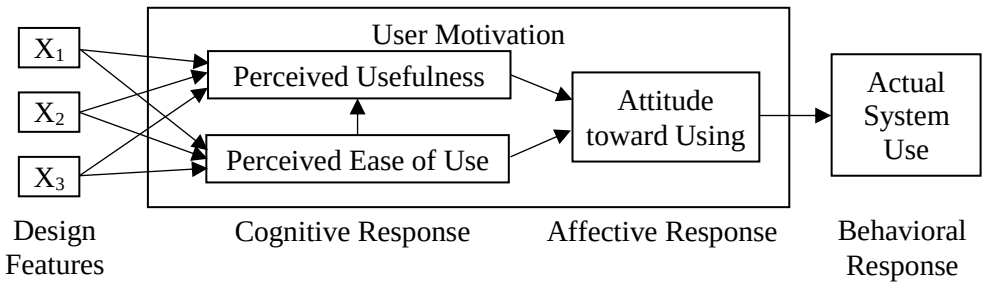


Figure 2.10: Technology Acceptance Model (TAM)
Source: Davis (1985, p. 24)

The original model of TAM has since been modified and extended by several researchers, with additional constructs added into the model such as: *behavioral intention to use* (Davis et al., 1989); determinants of *perceived ease of use* (Venkatesh and Davis, 1996); determinants of *perceived usefulness* and *intention to use* (Venkatesh and Davis, 2000) and Unified Theory of Acceptance and Use of Technology (UTAUT) by Venkatesh et al. (2003).

In the case of AIS effectiveness, where mandatory use of the system is applied, there might be no opportunity for the individual user to reject the system. However, their belief and attitude towards using the system are important in moderating their behaviour to perform effectively. Logically, as an AIS is operated by humans, the effectiveness of the system in generating information is affected by the way they accept, use and deal with the system. Empirically, *perceived usefulness* and *perceived ease of use* are found to have a significant influence on user's *behavioral intention to use* a computerised accounting system (Ilias and Zainudin, 2013). In addition, Ilias and Zainudin (2013) found that user's *behavioral intention to use* is associated with actual usage of the system. It is also found that psychological attachment has a significant effect on attitude towards using the system. Academically, the dimensions of TAM are commonly applied in assessing system quality, which is one of the common constructs used to measure system effectiveness.

2.6.2 User Satisfaction as a Measure for AIS Effectiveness

In DeLone and McLean's (1992) original paper, it is suggested that individual measures from the information system dimensions should be systematically

combined in order to build a comprehensive measurement instrument of system success. Prior to this study, there was no consensus on the construct for an information system, nor for AIS effectiveness. Success and effectiveness are sometimes applied interchangeably by prior researchers. Both can have different or similar meanings depending on the context of the study. Naturally, they are related to each other. Success in information systems is defined as acceptance and continued use of the system. On the other hand, effectiveness is widely referred to as continued achievement of the objective, outcome and impact of the system. The outcome and the impact of the system can best affect the system's users and the organisation in a broader context. Ives et al. (1983) pointed out that no matter how good and sophisticated the system is (from a technical perspective), if the users perceive it to be a poor system, then it is a poor system.

In a study of ABC management, McGowan and Klammer (1997) investigated employees' satisfaction with ABC management implementation and factors associated with it. Satisfaction in their study is viewed as success. The satisfaction was measured using single item scale that asking about individuals' overall satisfaction with the ABC management implementation.

Primarily, effectiveness that is based on satisfaction is achieved when the group or individual stakeholders' demands and expectations are fulfilled (Cameron, 1980; Pitt et al., 1995). Pitt et al. (1995, p. 176) further elaborate that these expectations are 'expressions of what they want'. Satisfaction was generally summarised by Bailey and Pearson (1983, p. 531) as being 'the sum of one's feelings or attitude toward a variety of factors affecting that situation'. User satisfaction towards AIS is seen as a measure of the system's social aspects that covers both the

output from the system (e.g. information) and the process to produce the output (Chalu, 2012). As the AIS is primarily run by the application of technology, the technical definition of end-user computing satisfaction is relevant. Technically, end-user computing satisfaction is defined as 'the affective attitude towards a specific computer application by someone who interacts with the application directly' (Doll and Torkzadeh, 1988, p. 261). Chin and Lee (2000) further add to the definition as the user's overall affective evaluation that is based on his or her experience with the information system.

Specifically focusing on system user satisfaction, Doll and Torkzadeh (1988) developed a model to measure End-User Computing Satisfaction (EUCS). The model consists of 12 items representing five dimensions which are content, format, accuracy, ease of use and timeliness. Test-retest reliability of EUCS model was performed by Torkzadeh and Doll (1991) and confirmatory factor analysis was conducted by Doll et al. (1994) to further confirm the validity and reliability of the instrument. The EUCS instrument has been widely applied by other researchers (e.g. Bakke et al., 2008; Dastgir and Mortezaie, 2012; Heilman and Brusa, 2006; Ilias et al., 2007; Ilias et al., 2009; Ilias and Razak, 2011; Mohamed et al., 2009) in measuring user computing satisfaction. Technically, the 12 items of EUCS are measuring the capability of the system in meeting user's requirements and providing the information needed by its user. The EUCS model is principally focused on system quality and information criteria that generally refer to the system's output to measure user satisfaction. However, for a broader application of system's user satisfaction in AIS to proxy the measurement of system effectiveness, referring only to the system's output may not be sufficient. In order to develop a robust

measurement for system effectiveness, the instrument should also cover the outcome from the system, in terms of usefulness and benefit, rather than just focusing on the output. Furthermore, considering the usefulness and benefit of the system, to be included in user satisfaction measurement for system effectiveness, is a reflection on the concept of technology acceptance. Technology acceptance highlighted two main dimensions, which are perceived ease of use and perceived usefulness of the system. These two dimensions are drawn in TAM by Davis (1985) as factors affecting the attitude towards system use. In particular, perceived usefulness towards the system presents the expectation of the system's users, and if fulfilled accordingly will result in satisfying the users.

The validity of user satisfaction in measuring information system effectiveness was confirmed by Gatian (1994). However, satisfaction measurement is perceptual and people may give dishonest or biased opinions. Moreover, developing an information system that satisfies its users is difficult (Ives and Olson, 1981). It is probably impossible to satisfy all users due to differences in their requirements. Nevertheless, there is always a minimum requirement for everybody, such as the function, feature and outcome of the system. Despites its weaknesses, user satisfaction is among the most widely used as a single measure in evaluating the success of an information system (DeLone and McLean, 2003, 1992) because it provides a meaningful concept and is easy to assess (Seddon, 1997). Nevertheless, user satisfaction alone is said to be insufficient for measuring system effectiveness (Myers et al., 1997) and information system success (DeLone and McLean, 2003). But the measurement can always be improved. A combination of constructs with a better scale that reflects the conceptual definition of effectiveness may improve the

existing effectiveness model. The development of an instrument that is based on the conceptual meaning of its constructs contributes to a better measurement that fits the construct definition (Davis, 1989). Measuring all aspects or dimensions of effectiveness at the same time is almost impossible due to the multidimensional nature of effectiveness. Thong and Yap (1996, p. 602) stated that 'it is pointless to search for a precise measure or set of measures of IS [Information System] effectiveness that will be common across all organisations'. Gable et al. (2003), based on the result of exploratory factor analysis in their study, reported that satisfaction construct and system quality are measuring the same concept. They further explain that 'pure satisfaction items alone do not reflect a separate dimension of success, but rather measures of overall success' (Gable et al., 2003, p. 581).

Thong and Yap (1996) acknowledged the complexity of user satisfaction to measure system effectiveness with the issue of a lack of theoretical support, a lack of measurement operationalization and misapplication of user satisfaction instrument. They called for more research to develop a new user satisfaction instrument. In addition, most of the previous studies in the context of AIS, information system, technology and computer measured user satisfaction according to various scales other than the scale of satisfaction, except for a few studies, as summarised in Table 2.4.

Conceptually, satisfaction itself does not have to be a single measure as a construct, but should be used to weight each of the effectiveness criteria that are required by the system user. The required criteria are those discussed in previous studies, such as system quality, information quality, impact and benefit from the system. In addition, measurement of the degree of satisfaction is more suitable for

presenting a definition of satisfaction with the system. The degree of satisfaction of the system's users indicates the extent of the system's ability to meet their requirements.

Table 2.4: A Summary of Measurement Scale Used to Measure User Satisfaction

Scale	Researcher
Disagree – Agree	Kouser et al. (2011), Ismail (2009), Mohamed et al. (2009), De Guinea et al. (2005), Gable et al. (2003), Myers et al. (1997).
Never – Always	Ilias and Razak (2011), Ilias et al. (2007), Torkzadeh and Doll (1991).
Non-existence – Complete	Rai et al. (2002).
Strongly unfavorable (Least favorable) – Strongly favorable (Most favorable)	McGowan and Klammer (1997), Thong et al. (1994).
Dissatisfied – Satisfied	Al-Maskari and Sanderson (2010), Ilias et al. (2009), Chin and Lee (2000), Kettinger and Lee (1994).

The adequacy of using a user satisfaction measurement for system effectiveness depends also upon the scope of satisfaction that is being assessed. If the satisfaction is assessed merely by asking about one part of the subject (e.g. please rank your level of satisfaction towards the system quality) or the question is too general, such as the one that commonly used in single item measure (e.g. are you satisfied with the technology performance in your organisation?), the effectiveness evaluation may not be accurate. According to McGowan and Klammer (1997, p. 234), ' a single item measure is very coarse and cannot adequately capture all of the aspects of this multidimensional constructs'. More specific questions should be asked in order to get a better understanding of the effectiveness evaluation. For example, for system quality, the user might be satisfied with some parts of the system's quality but not with others. Therefore, solely evaluating the overall satisfaction of the

system's quality may not be accurate. Furthermore, the level of satisfaction may vary from one situation to another due to changes in expectations. As user opinion and perception may change and vary from one to another, choosing the best respondent that has knowledge, experience, power and responsibility towards the selected domain of activity to be assessed may lead to more accurate results (Cameron, 1980). In the context of the AIS, the system's users may or may not be involved in all AIS processes. Thus, those who are involved with more tasks (i.e. reviewing and processing rather than just inputting the data) will have a better view of the system.

Several models such as TAM (Davis, 1985), EUCS (Doll and Torkzadeh, 1988) and D&M IS System Success (DeLone and McLean, 1992), as well as specific measures of ABC system success, have significantly contributed to the basis for development of user satisfaction measurement in information system, ERP, ABC system and AIS. These models and measures are then partially applied, or modified by other researchers, in the measurement of user satisfaction towards the studied system. Among the common constructs used in previous studies are system quality, information quality, system benefit, ease of use and usefulness of the system.

i. *System Quality*

An AIS is used to process the transformation of data into useful information in order to achieve the primary objective of the system (Iskandar, 2015). Therefore, system quality is often referred to as the capability of the system of providing the characteristics that are required by its users (Sacer and Oluic, 2013) in order to achieve the system's intended objective. According to Ismail (2009), system quality is commonly viewed in terms of technical characteristics of the system, such as

features, functions, response time and system reliability. Nevertheless, on top of the primary objective of the system, there are sub-objectives that vary according to the function and application of the system, as well as the level of its users. Measuring system quality is quite difficult because it has multiple dimensions, including technical, operational, tangible and intangible (Ifinedo and Nahar, 2006). One of the most widely used methods for measuring system quality is through system's users' perceptions. According to Ives et al. (1983), the system's users' view of system quality and performance reflects the reality of the system. Therefore, a good quality of system is reflected in a highly reliable system, as perceived by its users.

Based on prior studies reviewed by DeLone and McLean (2003), the quality of system was measured in terms of ease of use, functionality, reliability, flexibility, quality of data, portability, integration and importance. Ifinedo (2006) claimed that system quality appeared to be amongst the strongest predictors for system success in the context of ERP. Ifinedo (2006) measured system quality according to system flexibility, accuracy of data, ease to use and learn, reliability, allowance of data integration and customisation, efficiency, good features, integration with other systems and meeting of users' requirements. A successful system is perceived as easy to use and implement by the key members of the organisation (Ifinedo and Nahar, 2006). On the other hand, Rahayu (2012) measured the AIS based on three dimensions: transaction processing systems; transaction processing cycles; and components. The measurement items for the dimensions cover accessibility, system activity and function, align with need and requirement, smooth procedure and operation, integration, standard and security of system. Rahayu (2012) used users' requirements for measuring the quality of the AIS, which indicates the importance of

users' opinions in reflecting system quality. A study conducted by Komala (2012) evaluated the AIS based on its main components, which are hardware, software, brainware, procedure, database and technology of communication network. Overall, the items for each component asked about availability, function, administration, documentation, security and back-up. In a review of system quality in prior studies done by Indahwati (2015), system integration is stated as the main characteristic of information system quality.

ii. *Information Quality*

Ives et al. (1983, p. 785) technically defined user information satisfaction as 'the extent to which users believe the information system available to them meets their information requirements'. Similarly, Sacer and Oluic (2013) referred to useful information as being information that satisfies certain expected criteria by the user. Generally, the quality of information is needed in order to meet a user's requirements and expectations.

The quality of information is commonly referred to as the ability of the information to provide support for the decision-making task. Quality of information enables decision-makers to make a good decision with satisfactory justification for the decided matters (Medina et al., 2014). In the context of the AIS, effectiveness is viewed according to the system's capability of providing such information. The most common information quality characteristics that are used by previous researchers (e.g. Fitriati and Mulyani, 2015; Rapina, 2014; Komala, 2012; Rahayu, 2012; Dehghanzade et al., 2011; Ismail, 2009; DeLone and McLean, 2003) to measure the quality of information are accuracy, understandability, timeliness, completeness,

relevance, reliability and consistency. Gelinas et al. (2012) explained several characteristics of information quality, which are shown in Table 2.5. By all means, the quality of information is crucial in helping decision-makers to make the best decisions for the organisation (Fitriati and Mulyani, 2015).

Table 2.5: Several Characteristics of Information Quality

Quality of Information	Description
Accuracy	The correspondence or agreement between the information and the actual events or objects that the information represents.
Understandable	Information is presented in a form that permits its application by the user.
Timeliness	Information that is available to a decision maker before it loses its capacity to influence a decision.
Completeness	The degree to which information includes data about every relevant object or event necessary to make a decision and includes that information only once.
Relevance	Information has relevance when it is capable of making a difference in a decision-making situation by reducing uncertainty and increasing knowledge for that particular decision.
Reliable	Appropriateness of information that is valid, accurate, complete, neutral and verifiable.
Consistency	Information about the same object or event collected at two points in time can be compared. Derive from reliable and relevant information.

Source: Gelinas et al. (2012, p. 21 & 22)

Specifically investigated the two criteria of data quality, Pizzini (2006) examined the usefulness and relevance of cost data that is processed in the cost-system. Four cost-system attributes were examined: level of details; classify costs according to behaviour; frequency of cost reports; and variance analysis. The study found all attributes, except for variance analysis, are positively correlated with perceived relevance and usefulness of cost data.

iii. *System Benefit/Usefulness*

Davis (1989, p. 320) technically defined perceived usefulness as 'the degree to which a person believes that using a particular system would enhance his/her job performance'. An improvement in a user's performance and productivity is one of the benefits offered by a successful system (Seddon, 1997). System benefits can be either financial or non-financial. However, the benefit of technology investment is often difficult to measure financially. On the other hand, the non-financial benefits of technology emerge and evolve along with the technology cycle, as can be seen in terms of improvements in working processes, enhanced productivity and reduced cost, by having an electronic report rather than a hard-copy report (Myers et al., 1997).

Swenson (1997) investigated the benefits of ABC system implementation by measuring managers' satisfaction towards cost management system criteria. The study reported that the implementation of ABC system has improved costing management system and increased the satisfaction level of managers towards the system. The implementation of ABC system is appeared to strongly support decision making process; particularly decisions related to costing, such as sourcing and pricing (Swenson, 1997). Technically, the AIS plays a role as a support system for decision-makers to undertake planning and controlling activities for their organisation (Kharuddin et al., 2010). The system is designed to perform accounting functions (Belfo and Trigo, 2013; Pierre et al., 2013; Salehi et al., 2010). In addition, the system is expected to effectively manage the organisation's business-related activities (Dalci and Tanis, 2009). According to Ilias and Zainudin (2013), implementation of an AIS can improve the efficiency of the accounting operation.

Furthermore, the use of technology in accounting systems enables fast production of accounting related information (Sacer and Oluic, 2013, Mitchell et al., 2000).

2.7 FACTORS INFLUENCING ACCOUNTING INFORMATION SYSTEM EFFECTIVENESS

Technology and information systems that are influenced by people, organisations and the environment (Petter et al., 2008) require all of their components to perform well if the system is to operate effectively. Since effectiveness is about continued success, the definition of critical factors in this study is adapted from the definition of the critical success factors. Thus, the critical factors in this study are defined as key components that are important for the effectiveness of the system. Identifying the key components can be useful as guidance for planning, as well as for improving operations in order to achieve the system's success and effectiveness. In addition, knowing the key components can provide specific areas for the organisation and its staff to focus on, in order to ensure they maintain their success in the long term (Nfuka and Rusu, 2010).

Nevertheless, prior literature has reported mixed results on the factors affecting AIS, information system and ERP. According to Ifinedo (2008), a range of findings and interpretations resulted due to the different settings considered by authors, and the nature and type of the investigated system. A huge investment in technology can have a positive impact on the organisation. Therefore, it is important to know how the acquired system can help to achieve the organisation's goals (Ifinedo, 2008). Practically, an application of IT in the accounting process requires all AIS components to perform in parallel with technology performance in order to

gain benefits from it (Ismail 2009). The critical factors that lead to AIS effectiveness comprise of tangible, intangible, financial and non-financial aspects.

To date, there are numerous factors, reported by prior researchers, which can have a significant influence on the effectiveness of AIS. Chalu (2012, p. 2) mentioned that 'searching for the factors that could boost AIS effectiveness remains an issue of utmost significance for most of the organisations'. Some of the factors or determinants of AIS/information system effectiveness in previous studies were applied to surrogate system performance/success/effectiveness in other studies, or vice versa, depending on the context and objective of the study. The interchangeable use of factors that lead to effectiveness and criteria representing the effectiveness can sometimes be confusing and resulted in a mixture of findings. This happened mostly due to a lack of understanding about the nature of the system, in addition to the multidimensional phenomenon of information system measurement. As an example, DeLone and McLean (2003) suggested that other researchers identify and justify the independent and dependent variables in their studies to avoid confusion about the model process and causal relationship among the constructs. However, due to the nature of the information system construct or items that interact with and affect, the same item or construct can be applied as a proxy for a dependent variable or treated as an independent variable in another study, depending on the context of research. Hence, 'it is essential that IS [information system] researchers distinguish between the management control variables and the desired results in terms of quality, use, satisfaction and impacts' (DeLone and McLean 2003, p 17). In addition, Cinquini and Mitchell (2005, p. 73), in a study of ABC management success, emphasised that 'different stages of information system development may also have different

conceptions and different determinants of success'. Similarly, Choe (1996) asserted that the factors influencing information system performance are changing according to the evolutionary level of the system (i.e. initiation stage to maturity stage). Thus, it is important to clearly define the stage of system that is being studied in order to establish better findings and shed light on the mixed findings in previous studies.

A study on information system implementation by Wiechetek (2012) found three main categories for the determinants of effective information system implementation: social factors; organisational factors; and technical factors. Social factors are described in the study as factors that relate to the implementation team and the attitude of the organisation's staff. Organisational factors refer to the management of the implementation process, as well as to the management of the organisation. Thirdly, technical factors are based on characteristics of the system in terms of its capability and related infrastructure.

In a study of ERP implementation, Doom et al. (2010) identified 13 critical success factors based on prior empirical literature: a clear vision of strategic goals; senior management support; active user involvement; corporate culture; internal communication; relationships with suppliers; a formalised project approach and methodology; focus on user requirements; external consultants; training; planning; management; and composition of the team. In the same context of ERP implementation, Ram and Corkindale (2014) conducted a thorough review of prior studies with regards to the critical success factors of ERP implementation. The study summarised 33 critical success factors associated with ERP implementation success that were empirically tested in other studies. These are shown in Table 2.6.

Table 2.6: List of Factors Empirically Examined for Their Relationship with ERP Implementation Success

No.	Factors	Some references
1	Full-time project manager, training of personnel, presence of champion	Bradley (2008).
2	Top management support	An-ru et al. (2009), Ehie and Madsen (2005), El Sawah et al. (2008), Ifinedo (2008), Kansal (2007), Young and Jordan (2008), Žabjek et al. (2009), Zhang et al. (2003).
3	Training and education	An-ru et al. (2009), Lin et al. (2006), Sun et al. (2005), Xu and Cybulski (2004), Zhang et al. (2003).
4	Project management	Ehie and Madsen (2005), El Sawah et al. (2008), Ji and Min (2005), Kansal (2007), Zhang et al. (2003).
5	Business process re-engineering	Ettlie et al. (2005), Ji and Min (2005), Zhang et al. (2003).
6	Business process management	Žabjek et al. (2009).
7	Business process improvement	Law and Ngai (2007a, b).
8	Change management	Ji and Min (2005), Cheng et al. (2006), Žabjek et al. (2009).
9	Full-time project leader, proven implementation plan, utilisation of cost benefit analysis	Petroni (2002).
10	Project planning, organisational resistance and ease of use	Kamhawi (2009).
11	Leadership, external support	Ettlie et al. (2005), Ji and Min (2005).
12	Suitability of hardware and software, data accuracy	An-ru et al. (2009), Zhang et al. (2003).
13	Strategic planning, external expertise support, business vision, and project preparation	Cheng et al. (2006), Ifinedo (2008), Ji and Min (2005), Shi and Lu (2009).
14	Clear goal and strategy, powerful implementation team	An-ru et al. (2009).
15	IT assets	Ifinedo and Nahar (2009).
16	Acquisition strategy	Ettlie et al. (2005).
17	Culture	El Sawah et al. (2008), Zhang et al. (2005).
18	Organisational fit of ERP	El Sawah et al. (2008), Holsapple et al. (2006), Hong and Kim (2002), Motwani et al. (2008).
19	Key user satisfaction, employee satisfaction	Almashaqba and Al-jedaiah (2010), Wu and Wang (2007).
20	Group cohesion	Wang et al. (2006).
21	Feasibility and evaluation of ERP project, consulting services, and cost/budget issues	Ehie and Madsen (2005), Yang et al. (2006).
22	Balance of centrifugal and centripetal forces	Chien et al. (2007).

Continue…

…continue

No.	Factors	Some references
23	Software quality and information quality	Fan and Fang (2006), Tsai et al. (2009a).
24	Project team competence/experience, rewards, communication and change, multi-skilled team	Akkermans and van Helden (2002), Rothenberger et al. (2010), Wickramasinghe and Gunawardena (2010).
25	Knowledge management competence	Sedera and Gable (2010).
26	Information quality, system quality, service quality	Häkkinen and Hilmola (2008), Ifinedo and Nahar (2006), Ifinedo et al. (2010)
27	Internal support, function (functionality and fit with business)	Chung et al. (2008).
28	Task relevance, compatibility of ERP, higher educated users	Holsapple et al. (2006).
29	Dominance and promotion of high level management, establishment of implementation strategy, enhancing personnel cooperation, enhancing module capability and reducing costs	Lin et al. (2006).
30	IS resources, IS capabilities, executive support, business strategy	Ditkaew and Ussahawanitchakit (2010).
31	Project manager, project sponsor	Esteves and Pastor (2002).
32	Power issues	Yeh and OuYang (2010).
33	Management of data, link to business objectives, appropriate IS staff/technology	Poon and Wagner (2001).

Source: Ram and Corkindale (2014, p. 162-163)

Tuzcu and Esatoğlu (2011) empirically examined the success factors of an IT project and found appropriate planning with a clear statement of requirements and proper time management can have impact on the success of the IT project. People that are involved in managing IT are advised to consider these factors if they are to be successful, as well as for solving problems (Tuzcu and Esatoğlu, 2011).

Generally, most previous studies focus on the implementation stage of a system or a technology project. As discussed by Cinquini and Mitchell (2005) and Choe (1996), factors influencing the system change depending on the evolution stage of the system. For example, top management support might be the most important

factor during the pre-implementation stage but not the post-implementation stage as they are not directly involved with the system's operations.

As the AIS is part of the information system, empirical studies of the factors influencing the effectiveness of information system, IT and ERP are discussed further in this section. Furthermore, the criteria of an effective AIS (i.e. system quality, information quality and benefits of AIS) are referred to accordingly, during the search for system effectiveness determinants. Thus, other related empirical studies, such as studies on the factors needed to support the quality of information, quality of system, benefits, implementation and success of system are also reviewed because effectiveness is about sustainable quality and success. To enrich the finding of factors influencing AIS effectiveness, prior studies discussing the potential factors affecting the AIS, ABC system, information system, information technology and ERP, in terms of technology project system implementation and adoption are also reviewed.

2.7.1 People Characteristics

People are one of the elements in an AIS. They are responsible for operating the AIS, including data entry, process and output (Al-Hiyari et al., 2013). Each person will have their own characteristics. Technically, the people characteristic is viewed as the individual human aspect that affects their behaviour (Agung, 2015). Dehghanzade et al. (2011) found individual characteristics are associated with the effectiveness of AIS. The reported characteristics are openness, being competitive, self-oriented, accountability, and having a sense of job satisfaction. Logically, as a main actor in an

AIS, the users should have good characteristics in order to operate the system effectively, especially if it is a complex and large system.

2.7.2 Human Resource

Choe (1996) listed the composition of team members as one of the critical success factors of ERP adoption. Furthermore, Imtiaz et al. (2013) reported that selecting the right team affects the success of an IT project. Thus, getting the right employees with the necessary capabilities will contribute to the effectiveness of the system. In addition, the organisation should also put effort into retaining those employees through reward programmes and improving their knowledge through training courses (Chalu, 2012). Additionally, having a sufficient number of employees to handle the given tasks is also one of the human resource-related matters with which the organisation should be concerned.

2.7.3 Competency

Human resource competency is crucial for an organisation if it wants to gain a competitive edge (Taber et al. 2014). Competency refers to the skills and ability of a person to perform his or her duties in a capable manner. Iskandar (2015) discussed competency as the outstanding level of performance in delivering the required results set by an organisation. On the other hand, Aziz et al. (2012) summarised a person's ability under the skill dimension that consists of three elements: training/skills; communication; and knowledge/experience. An employee's capability is said to be one of the most important factors of the AIS (Tóth, 2012). A study conducted by Daoud and Triki (2013) asserted the importance of accounting personnel working

with other users of the AIS because information is shared and processed between them. Besides the interpersonal skills, technical skills in technology and work-related aspects also play a big role in today's world. Since almost all organisations are equipped with technological tools, IT skills are now crucial for development and effective use of technology. Iskandar (2015) concluded that user competency influenced the quality of the AIS.

2.7.4 Qualification of Personnel

In most organisations, the qualifications of personnel are among the criteria listed when hiring new staff. Qualifications imply personnel are capable of performing an allocated role. A good system needs qualified personnel to operate it effectively (Chalu 2012). Taber et al. (2014) suggested qualified human resources as being one of the factors to focus on if an organisation is to operate the information system efficiently. Imtiaz et al. (2013) used the qualification of personnel to indicate team capability, and reported a strong effect of qualified personnel leading to the success of an IT project. Chalu (2012) found a significant positive relationship between qualified personnel and AIS effectiveness. However, in practice, a lack of qualified personnel is one of the challenges being faced by organisations in developing countries (Iskandar, 2015).

Within the Malaysian Government, employees are recruited based on their education background and qualifications. The allocation of an employee's position commonly depends on his or her level of education. For example, a majority of account executives hold a degree in accounting or finance as their minimum level of educational qualification background. The recruitment and staffing of accounting

personnel is mainly managed by the Accountant General Department (AGD). Some recruitment within the Government is managed by the Public Service Department, who is also responsible for planning, developing and managing human capital for the Government.

2.7.5 Knowledge

Knowledge is said to be one of the important factors an organisation needs to survive in a highly competitive environment, as well as for facing challenges and grabbing opportunities (Issa-Salwe et al., 2010). Prior studies (e.g. Nabizadeh and Omrani, 2014; Tamoradi, 2014; Daoud and Triki, 2013; Hajiha and Azizi, 2011; Ismail and King, 2007) asserted the importance of an owner/manager's knowledge for making better use of the AIS. Widespread use of technology in accounting duties requires knowledgeable personnel to effectively support the firm's operation (Mgaya and Kitindi, 2008), especially in providing high quality information for decision-making (Sajady et al., 2008). Tóth (2013) stated that knowledge plays a significant role in maximising the AIS function. Chalu (2012) described knowledge as the determinant of an effective AIS. Inadequate knowledge about the information system has been identified as one of the challenges in AIS application that might lead to information errors (Appiah et al., 2014). Awosejo et al. (2013) suggested the development of users' knowledge through formal education, training and workshops, in order to optimise the utilisation of AIS. Furthermore, the combination of technology requirements and accounting needs require the system's users to be adequately equipped with relevant knowledge so that competitive advantages of AIS can be gained accordingly (Agung, 2015).

In the last few decades, users of IT could focus on completing their work without thinking about how technology assisted and processed their tasks. However, in this highly competitive technology era, it is necessary for the user, especially the accountant, to understand the operation of the technology tools used (Tam, 2011; Mgaya and Kitindi, 2008). Their understanding of the system's operations is essential as they are not only required to produce the information but they must be able to present and explain it in detail (Daoud and Triki, 2013; Mgaya and Kitindi, 2008). This does not mean that they have to know everything about the system as some of it might not be within the scope of their job (e.g. data programming) (Tam, 2011). However, they should at least have a general knowledge about how the system works, as well as the ability to turn the data into valuable information.

Logically, high-specification technology needs a high level of knowledge for it to be appropriately managed and operated. An inadequate knowledge is one of the reasons for the inefficient use of the AIS (Pierre et al., 2013). A lack of knowledge might also lead to unintentional errors, which subsequently causes ineffectiveness of the AIS (Appiah et al., 2014). In the worst-case scenario, the errors in information might lead to wrong decisions being made by the organisation. In addition, inadequate knowledge can also cause inefficiencies and task redundancy. Having sophisticated technology does not assure high quality information if the system is not properly operationalised. Ismail and Abidin (2009) and Mgaya and Kitindi (2008) found that the accountant's perceived level of knowledge is below the perceived level of desired knowledge. According to a survey conducted by Mgaya and Kitindi

(2008) in Botswana, an accountant should have advanced knowledge[2] in accounting packages and spreadsheets, as well as intermediate knowledge[3].

Prior studies found a significant impact of the manager's accounting knowledge (Kouser et al., 2011; Ismail, 2009) and manager's AIS knowledge (Kouser et al, 2011) on the AIS effectiveness. Consistently, a study by Komala (2012) found an accounting manager's knowledge to have a significant influence on the quality of AIS. Furthermore, Wiechetek (2012) found that knowledge about IT management, skills among the team members and management skills of project leaders are crucial for the effectiveness of the information system's implementation.

Generally, the importance of knowledge has been widely acknowledged to be one of the drivers of success and effectiveness. Knowledge does not just about know but also about the capability of turning information into actions and applying it in practice. Additionally, knowledge should be developed from time to time and this improvement should be parallel with the revolution of technology.

Nevertheless, it is essential to note that one of the objectives in technology advancement is to simplify the accounting process while maintaining the quality of data. The enhancement of technology results in user-friendly applications, easy implementation and ease of use of the system function. Ismail (2009) found the effectiveness of vendors and accounting firms, in contributing to the effectiveness of AIS, as well as having a user-friendly package minimised the needs for AIS knowledge among managers in SME. However, in a large and structured organisation, such as the government, the direct impact of knowledge on an AIS may

[2] Advanced knowledge is defined as user's ability to operate the software package's advanced features with some assistance.
[3] Intermediate knowledge is defined as the user's ability to operate the software package effortlessly but not its advanced features.

vary. It is often the case that the employees are allocated with a very specific task (i.e. procurement section), with specific guidelines on how to do the task and how to operate the particular system. As such, they are doing their routine every day, especially if they are middle or lower management level.

2.7.6 Experience

Apart from knowledge, experience also plays a significant role in contributing to AIS operation (Tóth, 2012). Experience is considered to be one of the fundamental parts that enable the successful implementation of data quality control (Saleh, 2013). Choe (1996) used an experience scale (i.e. number of years) to measure the capability of information system personnel. Choe (1996) found that experienced users make better use of the system. The system's user's experience is also reported to have an impact on AIS effectiveness (Dehghanzade et al., 2011) and the effectiveness of information system implementation (Wiechetek, 2012).

2.7.7 Commitment

Iskandar (2015, p. 156) summarised commitment as 'a conviction, sincerity and strong support'. Generally, commitment is a dedication towards goals, objectives or something that the person wants to achieve. A system's user's commitment to the AIS refers to the user's dedication, which can also reflect his or hers effort towards the performance of the system. Commitment requires encouragement and motivation (Kuraesin, 2015). Furthermore, commitment often entails some benefits or rewards in return. In most cases, commitment and benefit are related to each other.

According to Myers et al. (1997), the benefit from an information system can only be gained if the system is actually used. Considering the argument by Seddon (1997) in which system use precedes the benefit of the system, and the updated D&M IS Success Model that show system usage leading to user satisfaction, effective use of the system is also suitable for consideration as one of the items for measuring user commitment towards system effectiveness. A dedicated user is often eager to effectively use the system which in return brings benefit to them. This may shed light on the controversy of system use as a measure for system success (cf. DeLone and McLean, 2003; Seddon, 1997; Thong and Yap, 1996). *Use* may be voluntary or mandatory, and it may be appropriate or inappropriate. Whether *Use* contributes to success depend on the context of *Use*, and on whether it brings benefits or not. However, a user's commitment to effectively use the system will usually precede the benefit to the user, as well as to the organisation, in both mandatory and voluntary cases. This is because, logically, commitment comes with responsibility, wherein the issue of inappropriate use can be avoided.

Rahayu (2012) stated that top management commitment contributes to the enhancement of AIS. Consistently, Zhang et al. (2013) reported top level management commitment to be one of the critical factors of IT service management implementation. However, Saleh (2013) found a significant relationship between commitment and the quality of data in the AIS among middle level management, but not top level management. This suggests that middle management commitment is an important contributing factor towards the quality of AIS when compared to top level management commitment.

Rapina (2014) later reported that management commitment significantly influences, partially and simultaneously, the quality of AIS and the quality of accounting information. Furthermore, Iskandar (2015) reported that management commitment affects the quality of AIS. In a general sense, commitment is the individual's engagement towards something. Highly dedicated employees tend to perform better than those who are not dedicated. Syaifullah (2014) describes several dimensions of organisational commitment, including employees' emotion and wish to stay with and feeling of obligation towards the organisation. Organisational commitment, as discussed by Nurhayati (2014), referred to an individual's sense about his or her engagement with the organisation. Syaifullah (2014) concluded that the quality of AIS is effectively influenced by the organisational commitment. Similarly, Fitriati and Mulyani (2015) found a significant positive relationship between organisational commitment and AIS success. Indahwati (2015) later reported that organisational commitment has an impact on the quality of AIS. According to Fitriati and Mulyani (2015), employees that are more committed tend to work harder and longer and do their best to implement and operate any systems in their organisation, including the AIS.

Generally, a system user's commitment is important not just during the adoption stage but also for continued use of the system. Complexity of technology requires the system's users to be knowledgeable, competent and capable of operating the system. Thus, a successfully functioning system needs full support from its users (Fitriati and Mulyani, 2015). Usually, highly committed system users are likely to learn more and know more about the system. Thus, the functions in the system can be optimised which, in return, brings benefit to the users.

2.7.8 Top Management Support

The importance of top management support has been widely discussed as an enabler for project success, system implementation, continuous development and improvement of information system performance. Especially in the case of mandatory implementation of the system, there is the potential for people to dislike the system and feel pressure to use it (Ilias and Zainuddin, 2013). Therefore, top management should play their role by giving support to the operating team. Strong support from top management is helpful in addressing any related issues that require their attention (Rapina, 2014). A lack of support from top management is more likely to cause problems when seeking for better AIS (Chalu, 2012). A misalignment between organisational and individual goals may arise due to the different perceptions held by middle/lower management and top management about the same thing. This may lead to misdirection of the organisation. Wiechetek (2012) categorised the staff's perception of information system implementation as one of the social factors that leads to the effectiveness of system implementation. Therefore, top management support may help in creating a good perception towards the acquired system and in minimising uncertainty amongst employees.

Furthermore, top management support is crucial in ensuring sufficient resources such as providing facilities and a good environment for the effectiveness of the AIS (Chalu 2012). Wiechetek (2012) emphasised the importance of the manager's involvement in information system implementation effectiveness. In the context of ERP, top management support has been discussed as one of the critical success factors for ERP adoption (Ngai et al., 2008) and ERP implementation (Nah and Delgado, 2006). Aziz et al. (2012) applied top management support as one of the

elements in the critical success factors of IT and information system implementation. According to Thong et al. (1996), top management is more likely to be seen as a role model by middle and lower management and their support will encourage a positive attitude of system users towards effective use of the system. In addition, top management recognition of the importance of AIS, on an on-going basis, is needed to sustain the system's effectiveness (Chalu 2012). Komala (2012) found top management support had a significant influence on the AIS. In other context of studies, top management support was found to have a strong impact on IT project success (Imtiaz et al., 2013) and significantly correlates with employees' satisfaction towards ABC management implementation (McGowan and Klammer, 1997). Foster and Swenson (1997) found top management support as a determinant of ABC management success.

In practice, top management support is needed in most cases. However, this may not always be a critical factor in system effectiveness. The importance of top management support can change, depending on the size of the organisation and the stage of the system (i.e. development, implementation and maturity). In the case of a small organisation, Thong et al. (1996) demonstrated the importance of top management support throughout the information system implementation process and showed they can be compensated by the active role of external expertise (Thong et al., 1996). The result is consistent with Kouser et al. (2011) and Ismail (2009) who reported an insignificant relationship between manager participation in AIS implementation and AIS effectiveness. As the key decision-maker, often their active involvement and participation is needed during the planning and decision-making

stage, instead of at the post implementation stage. The latter requires more attention from the implementer because they are the people who are operating the system.

2.7.9 Internal Expert

Internal expert comprises of key internal stakeholders that play roles in developing, maintaining and improving the AIS. The internal expert consists of direct and indirect users of the system such as the councillor, auditor, IT personnel and accounting personnel.

According to Chalu (2012), the councillor's education and experience, which leads to their active involvement and interest towards the information provided by the AIS, is important in order to keep the system effective. The councillors, in Chalu's (2012) study, are referred to as politicians. Generally, they have power and influence over the government's operations. In the case of the Malaysian Government, the politicians are positioned at the higher management level and are involved in governing the Government, rather than in operations such as accounting. The accounting matters are managed by the AGD with cooperation from all ministries. The AGD acts as headquarters to all accounting offices at each ministry throughout the Government. The AGD plays significant roles in developing, maintaining, managing, governing, controlling and monitoring the accounting matters, including the AIS. Internal experts, such as IT technicians and accounting experts are provided by the AGD, alongside IT support from each ministry.

Information quality is of particular concern to auditors. The auditor is an expert in assessing financial reports and its related procedures. They play an important role in ensuring the AIS works effectively by verifying the adequacy and

reliability of the information as well as offering suggestions for system improvement (Chalu, 2012). In the context of the Malaysian Government, audit tasks are performed by the National Audit Department of Malaysia. The auditor works independently from the Government's organisations in order to produce an independent audit report. They also assess the government's organisational performance and provide an index rating for the organisation's financial performance. The rating is set as one of the organisations' key performance indicators. This suggests that the AIS is a priority in terms of managing the organisation's financial activities and records in the Malaysian government.

On the other hand, in some organisations, AIS is supported by a specific department, typically the IT or information system department. The department is commonly referred to by the system's users if there is any problem relating to the system. In order to satisfy system's users, support from the information system department in terms of installation, knowledge, training and online help, is crucial because the users rely on them (Pitt et al. 1995), especially for technical issues. Zhang et al. (2013) found IT staffs' capability and participation are the critical factors for the implementation of IT service management project.

2.7.10 External Expert

External expert is an expert from outside an organisation. The most discussed external experts in the AIS field are consultant and vendor. Consultant plays a role in providing advice to an organisation on which system to choose, as well as implementation, management, improvement and maintenance of the system. On the other hand, vendor offers a product such as an AIS software package. The vendor

often provides after sales service and act as a consultant for a certain period of time. Generally, the vendor contributes in terms of providing advice and support in more technical matters related to the installed system.

Ifinedo and Nahar (2006) asserted that the use of vendor and consultant might be needed by larger organisations more than smaller organisations. This is due to the complexity of the system in large organisations, in which the system requires close attention and needs more interaction with the vendor or consultant, especially during the early adoption of the system.

Zhang et al. (2013) reported that the consultant's ability to solve problems, their experience and good communication with management are among the critical factors of IT service management implementation. However, the need for an AIS consultant availability is found insignificant in the case of an organisation that has its own expert to manage the system and when the recruitment of the consultant is decided by the central organisation (Chalu, 2012). This is more likely to happen in large organisations with a complex structure, such as government, international corporations, and multinational companies. Large organisations commonly recruit the consultant when needed (during the development and early implementation phase) and on a contractual basis. Practically, the organisations tend to take advantage of the consultant through a knowledge transfer program (i.e. from the consultant to their internal expert) during the contract period. Thus, a consultant might not be needed at all times. In the context of smaller organisations, a consultant might be needed to replace the absence of an internal expert (Thong et al., 1996). Thong et al. (1996) found that a consultant's effectiveness leads to greater user satisfaction, a positive impact on an organisation and an overall improvement in the

effectiveness of the information system. Conversely, Ismail (2009) found an insignificant relationship between consultant and the AIS effectiveness among SME. This result is consistent with Kouser et al. (2011), who found an insignificant impact of consultant on AIS effectiveness among organisations in textile and cement sector that are listed on the Karachi Stock Exchange Pakistan. The non-reliance on consultant might be due to the maturity of the IT and the user-friendly package that offers ease of use features for operating the system (Ismail, 2009).

In addition, the availability of other alternatives, such as seeking advice from vendor, minimised the needs for consultant (Ismail, 2009). According to Thong et al. (1996), vendor can also act as a consultant, especially in the case of a small organisation. Similarly, Ismail (2009) found that vendor effectiveness significantly contributed to the effectiveness of the AIS. In contrast, Kouser et al. (2011) reported an insignificant relationship between vendor effectiveness and AIS effectiveness.

In the context of the Malaysian Federal Government, a vendor is most likely needed for technology-related and accounting software matters, such as accounting system development, installation and the early implementation stage of the system. On the other hand, consultant is appointed to assist in accounting matters. Both are recruited on a contractual basis. In addition, a close relationship between the internal experts and the external experts is built during the contractual period, during which they are working together to ensure the accounting practices are aligned with the installed technology and meet the Government's requirements.

2.7.11 Training

'Training is the action aimed at developing workers' aptitudes, attitudes, and skills so they can perform their job effectively' (Medina et al., 2013, p. 1). Training programmes offer ways to improve system's users' skills and knowledge. According to Medina et al. (2014, p. 136) 'training provides the tools needed to apply practical solutions to problems encountered in the workplace'. Ifinedo and Nahar (2006) suggested the need for relevant training and exposure towards the implemented system in order to achieve the intended benefit and outcome from the system. Having an adequate training program is recommended to encourage system usage and reduce hesitancy (Tijani and Mohammed, 2013). Additionally, adequate training is also needed in order to update employees' knowledge and skills, which subsequently leads to enhancement of their productivity (Norfazlina et al., 2016) and effective operation of the system (Chalu, 2012). McGowan and Klammer (1997) found a positive association between training (i.e. adequacy and resource) and employees' satisfaction with ABC management implementation (viewed as ABC management success of implementation). A lack of training may limit the development of personnel's skills and ability to cope with the technology and any changes surrounding the organisation. Medina et al. (2013) asserted that training is important for acquiring a competitive advantage over others.

Logically, system's users are more likely to use the system if they know how to operate it. Especially in an AIS, the system's users are dealing with accounting data, information and technological tools, in which a lack of knowledge may prevent the optimal use of the system functions. Moreover, complexity of the technology, along with high demanding task requirements, may impair the productivity of the

employees (Norfazlina et al., 2016). Often, people with a lack of knowledge tend to minimise the utilisation of system functions in order to avoid making mistakes. According to Choe (1996), voluntary and frequent use of the system can be increased with an adequate user training program. However, Medina et al. (2013) found an insignificant relationship between training and the system's users' satisfaction towards the AIS. They explained that inadequate training may be the reason for the findings in their study. Furthermore, the need for knowledge improvement through a training program is getting even tougher due to rapid changes in technology, as well as an enhancement in accounting practices. As technology improves, users' expectations also evolve. Thus, a lack of training can lead to expectations not being met, which leads to dissatisfactions. As such, a continuous engagement in learning and knowledge development is important in order to equip employees for future changes and encourage them to use the technological tools in the most effective way (Medina et al., 2014).

Furthermore, Wiechetek (2012) asserted that periodic training for the system's administrators and the system's users is crucial if an information system is to be implemented effectively. In the context of AIS operations, periodic training is essential for ensuring the optimisation of the system's functions and applications. As the demand for better management arises due to day-to-day improvements in the business world in a highly competitive environment, a lack of training may disable the capability of the organisation to compete with other organisations. In the context of the Malaysian Federal Government, training programmes are set and managed by the AGD. Additionally, the accounting offices of each ministry also provide training for their accountants, depending on their needs and budget. Training is not just to

prepare employees for a new system but also to improve their knowledge and skill using the current system in place. Training provided by the AGD is commonly held for a big project, such as implementation of a new accounting system or any update related to accounting and the system that requires involvement from all ministries and responsibility centres. On the other hand, training delivered by accounting offices is aimed at overcoming the weaknesses of the accountants within the ministry and the respective responsibility centres, as well as improving their knowledge and skills. However, a training program requires significant financial investment and thus becomes challenging in today's organisational human resource development (Iskandar, 2015).

2.7.12 Culture

Fitriati and Mulyani (2015) discussed culture as being about shared values, trends, patterns, norms and beliefs that bring people together. According to Rapina (2014, p. 150), 'culture is a social knowledge among members of the organisation'. Generally, as an organisation is run by people that are affected by its surrounding environment, culture plays an important role towards the organisation's energy and performance. Aziz et al. (2012) considered organisational culture as an element in the critical success factors of IT/information system implementation.

In the context of an AIS, Wiechetek (2012) listed a project culture as one of the determinants for effective information system implementation. A positive and supportive culture is more likely to offer a positive impact on a system's implementation. Similarly, Fitriati and Mulyani (2015) reported that culture has a strong positive relationship with AIS success. Nevertheless, the impact of culture is

hard to accurately assess when reviewing a particular section or outcome. Generally, the impact of culture is wider, intangible and more likely to be seen as an overall outcome rather than a single outcome. For example, a supportive culture can generate a positive working environment that encourages a high commitment amongst the employees. However, the employees' commitment may not just be towards their job scope, but towards a wider scope (e.g. towards their organisation). On the other hand, the supportive culture may just make them feel good about their working environment but not necessarily make them a more committed worker.

2.7.13 Strategy

Strategy for achieving and sustaining the effectiveness of AIS is crucial for ensuring the system, and its components, are operated effectively as needed by the organisation. However, problems exist when a strategy is not explicitly available and is not clearly communicated to all levels in the organisation (Ballantine et al., 1998). Ambiguity of the AIS direction and unclear system objectives may result in a negative view of the acquired system. This negative perspective can become an obstacle in the implementation of the system because the system's users may feel pressured into using the system.

According to Wiechetek (2012), employee's understanding of the organisation, the information system implementation process and the system objectives will influence the effectiveness of system implementation. In the context of ERP, a clear vision of strategic goals has been described as one of the critical success factors for ERP adoption (Ngai et al., 2008), ERP implementation (Doom et al., 2010; Nah and Delgado, 2006) and ERP upgrading (Nah and Delgado, 2006).

Specifically focused on ABC management success, McGowan and Klammer (1997) found that sharing the objective of ABC management implementation among employees is positively associated with employees' satisfaction towards the implementation. Furthermore, Tuzcu and Esatoğlu (2011) concluded that appropriate planning influences the IT project's success. The appropriate planning in their study refers to a complete and accurate guideline of requirements at the start of the project and good time management to achieve the requirements.

Nevertheless, literature mostly discusses the importance of strategy for the adoption or implementation stage of the system. In an on-going and stable AIS, the strategy is most likely to embed within the AIS environment. For example, providing adequate training for the system's users is one of the strategies an organisation can use to improve the knowledge of its users to ensure better utilisation of the system.

2.7.14 Procedures and Regulations

Documentation quality is important for effective information system implementation (Wiechetek, 2012). Having proper documentation enables the implementation team and the management to keep track of the system's progress, as well as offering them a list of further action they could take. Additionally, the documentation of the system development is useful for recording the particular process and the experience of the involved personnel. It is also helpful for the development of procedures and regulations for the system.

According to Romney et al. (2013), procedure is one of the main components in the AIS. Both procedure and regulations serve as guidance for the system's users. It offers an easier way to use the system in a systematic and ethical manner.

However, that guidance is useless if the system's users do not comply with it. Saeidi et al. (2014) asserted that consistent compliance with the prescribed regulations and standards is important for system effectiveness. Breaking the provided procedure and regulation invites risk for the security and control of the system. Subsequently, that may lead to the system being ineffective.

2.7.15 Relationship and Cooperation

Myers et al. (1997) discussed the importance of work groups as an intermediate between an individual and organisational performance. Good relationships and cooperation between staff at all levels is needed for better performance as a team, as well as for the organisation. The importance of work group impact was also recognised by Ifinedo and Nahar (2006). They proposed work group impact as being one of the dimensions in the ERP system success model.

According to Ifinedo and Nahar (2006), functional and inter-departmental cooperation is needed in order to be efficient. In the context of AIS, the system comprises of several components, of which people are one of them. The system also connects several departments within the organisation (Saeidi et al., 2014). For example, a transaction updated in the inventory department is linked to the payable department. Therefore, the relationship and cooperation between the system's users as well as its related departments is important for smoothing the accounting process. In addition, cooperation among employees should not just be limited to being between departments but should also exist between levels of management (i.e. top, middle and lower level) (Saleh, 2013).

2.7.16 Teamwork and Communication

The importance of relationships and cooperation cannot be achieved without good teamwork and effective communication. Practically, economic and financial transactions that occur are not solely processed and managed by the accounting department. The transactions will start from other departments, such as the procurement department, and are forwarded to the finance department to be processed before coming to the accounting department for recording, analysing and reporting in a specific standard format. Therefore, teamwork and communication is needed between the involved personnel and departments in order to smoothly perform the required tasks. Imtiaz et al. (2013) reported that teamwork and effective communication contribute to the success of an IT project. Similarly, Aziz et al. (2012) classified teamwork as an element in the critical success factors of IT/information system implementation. Furthermore, Saleh (2013) found a significant positive relationship between teamwork and the quality of data in the AIS.

On the other hand, communication is reported as a critical success factor of ERP implementation and ERP upgrade by Nah and Delgado (2006). Wiechetek (2012) categorised communication skill among team members under social factors of information system implementation effectiveness. Communication is important as it is one of the ways to transfer and deliver information from one person to another. Thus, communication is not just important between the system's users but also between top, middle and lower management.

Logically, the need for good communication and teamwork cannot be avoided because the AIS is designed to be operated by several people working on different processes. Especially in the context of the government, which will have a

highly structured control system with a segregation of duty, good communication and teamwork are needed in order to complete accounting processes. A lack of communication and bad teamwork within an organisation may delay some of the accounting processes and thus lead to system ineffectiveness.

2.7.17 Monitoring and Review

Monitoring is part of internal control and is conducted as a continuous process or separate assessment (Vaassen, 2002). Most of the AIS is built with internal control mechanisms. However, the AIS consists of multi-components that work together, in which any changes or defects in one of the system's components may affect the system's internal control. For example, a manual data key in error may not be detected by the system. Therefore, a periodic inspection on the supporting documents is practised to ensure the quality of the recorded data. A study conducted by Sacer and Oluic (2013) found 85% of their respondents support the activities related to data quality checks in the AIS. Furthermore, monitoring and review activities should not only cover accounting information but also people, technology and AIS related procedures. This is consistent with the Malaysian Federal Government practice, in which the Government has a periodic inspection of the recorded data and its related documents, as well as the required procedures. The practice aims to ensure the quality of the recorded data and to identify weaknesses of the involved processes that could be improved in the future. In addition, Foster and Swenson (1997) and McGowan and Klammer (1997) found a positive correlation between performance evaluation that linked to ABC management system and the success of ABC management implementation (i.e. measure based on satisfaction).

Furthermore, Sacer and Oluic (2013) stated that an audit of the system is important to ensure the system is performed as needed and data integrity is maintained as required. On the other hand, Chalu (2012) found a significant positive relationship between external auditor specialisation (i.e. based on industry) and AIS effectiveness, in which this relationship weighted more towards the information quality dimension in system effectiveness measurement. However, monitoring and review activities may not always directly affect the AIS effectiveness. It may depend on the scope of the activities performed. For example, the objective of system audits is to ensure the system operates as required. Thus, this activity may weight more towards ensuring the capability of the installed technology to support the AIS, instead of leading to the quality of the system.

2.7.18 Sophisticated Technology

There is no doubt that the emergence of IT has influenced the way AIS is operated in today's business environment (Sacer and Oluic, 2013). Sophisticated technology allows a complex process to be done in a simple way, such as an automation of calculation check and match in the AIS. In addition, sophisticated technology enables the AIS to manage a high volume of transactions when compared to manual accounting. Ramazani and Allahyari (2013) asserted that the automation of certain accounting tasks by technology has reduced the time spent by managers on preparing financial information and reports. That gives them more time to work on other activities such as monitoring, analysing and identifying a strategic opportunity for their organisation.

Typically, the common criteria that are expected by the system's users from the acquired technology are an easy to use system, integration between systems and the processing speed. These criteria reflect the quality of the system. Practically, a good system is supported by technology that is capable of providing these criteria. In the TAM, Davis (1985) illustrated the importance of technology features (i.e. ease of use and usefulness) towards the attitude of the system's users. It shows that the technology should be designed to ensure the system's users see the system as simple and useful, to encourage system usage. Thus, sophisticated technology is one of the important aspects that help to simplify the complex structure of technology and the system, which subsequently makes the system easy to be used and useful to its users. The growth of technology has continuously improved the existing 'applications software and network infrastructure which, although sophisticated, were increasingly use-oriented and friendly' (Mitchell et al., 2000, p. 3). According to Sacer and Oluic (2013), modern technology contributes to the quality of the AIS. Up-to-date technology is important for the organisation to remain competitive due to rapid changes in technology, increase in transaction volume and changes in the business environment. In some cases, the organisation needs to adopt a new technology. Logically, new and sophisticated technology offers better capability and processing performance.

In addition, sophistication of technology is also viewed in term of the number of available applications (e.g. general ledger, inventory, billing, payroll, budgeting and etc.) offered by the accounting software installed in an organisation. Kouser et al. (2011), duplicating a study conducted by Ismail (2009), hypothesised that sophisticated AIS encourages a higher degree of system's effectiveness. However,

Kouser et al. (2011) and Ismail (2009) found an insignificant relationship between AIS sophistication and AIS effectiveness. Furthermore, sophisticated technology is often comprehensive and has integrated functions between sub-systems or sub-applications. In the context of AIS in ERP, the sophisticated features of technology were found to increase the relevance and reliability of accounting information produced by the AIS (Alzoubi, 2011).

The criteria of sophisticated technology are considered in different ways throughout the literature. However, the aim of sophisticated technology is to support the operations of the system in order to provide benefits and system quality to users.

2.7.19 Compatibility and Flexibility of System

Compatibility of system refers to a system that is aligned with an organisation's structure, its employees and its activities (Ramazani and Allahyari, 2013). In other words, a compatible system operates to fully support the organisation's needs. In the context of AIS, the compatibility of the system is crucial to ensure the system is capable of processing accounting records and producing useful information that is needed by management for decision-making. Therefore, careful selection of the right system is highly important for a successful implementation of that system, as well as better organisation performance. In most cases, a system that is not compatible with an organisation leads to cost overrun. In the worst case scenario, the system can end in failure (Ramazani and Allahyari, 2013). A later study by Ramazani et al. (2014) found the importance of accounting software compatibility for the system to be prioritised, in terms of its usage, according to the system's users' point of view. The

finding suggested that the compatibility of accounting software should be among the top considerations in accounting software selection.

Furthermore, an effective system is said to be a system that is flexible in order to cope with any changes in the organisation environment and transactions. Byrd and Turner (2000) summarised flexibility, in the context of IT, as the ability of the technology to adapt and respond to any changes surrounding the business and organisation. Therefore, system flexibility is viewed as the ability of the system to effectively control any changes that require the system to respond. Wiechetek (2012) reported the importance of IT system flexibility towards the effectiveness of an information system implementation. Byrd and Turner (2000) considered flexibility as one of the critical components that IT should have in order to address rapid changes in the business environment.

Nevertheless, the decision of accounting software selection and any changes to the system is often made by the top management level. Especially in the context of a large organisation, such as the government, the use of the system is typically mandatory. In addition, the system is customised according to the government's needs. Although the decision is made by top management, the system's users' opinions are also considered accordingly during the development stage of the system. Moreover, improvements will be made of the system from time to time depending on the needs of the system's users and the government.

2.7.20 Infrastructure

Infrastructure is one of the main components that is crucial for today's AIS. Since almost all organisations use technological tools in their AIS, an appropriate

infrastructure should be carefully selected in order to have a good system in place. The development and improvement of IT infrastructure is often a priority in overall IT management (Byrd and Turner, 2000). According to Wiechetek (2012), suitable infrastructure is important for an effective implementation of the information system. Ramazani and Allahyari (2013) asserted that the suitability of AIS-related components is important for the development of a strong internal control in an organisation. A strong internal control is highly important especially in a technology environment, in order to minimise the risk related to AIS (Sacer and Oluic, 2013).

Specifically focusing on the quality of three (3) components in an AIS, which are software, hardware and database, Taber et al. (2014) found a significant relationship between those components and AIS efficiency. In a study of AIS quality, Indahwati (2015) reported that the information system infrastructure affects the quality of the AIS. In addition, appropriate IT that is used to perform accounting tasks offers several benefits, such as reduced cost, higher quality information and enhanced information productivity (Sacer and Oluic, 2013). A development and an implementation of a system that does not suit current organisation practice will result in a major revision on organisation related matters, such as policies and procedures to adapt to the new system (Thong et al., 1996). This may cause budget overrun or even lead to the system being abandoned.

Similar to the selection and changes to an AIS, the technology infrastructure to support the system is often decided on and allocated by top level of management. In practice, the AIS-related infrastructure is periodically maintained by the IT department and replaced in line with the organisation's policy. For example, computers are replaced every three to four years.

2.7.21 System Security and Internal Control

System security and internal controls are among the crucial ways of protecting and ensuring the quality and safety of the recorded data in the AIS (Saeidi et al., 2014). For example, having a password and authorisation level to access the system can prevent unauthorised data modifications and stolen data. Furthermore, in this globalisation era with borderless connections from one place to another, a strong internal control is highly needed to ensure the quality of the AIS (Sacer and Oluic, 2013). A weak internal control and a lack of security system may cause doubt on the reliability of the system and decrease the quality of information it produces. Ramazani and Allahyari (2013) asserted that the output produced by the AIS may not be managed appropriately if its functional control is weak and thus creates mistrust among the external parties towards the organisation's credibility.

Commonly, most of the accounting software packages are designed with a built-in system security and internal control function. However, in the context of complex and large organisations, stronger internal controls beyond the internal control function provided by the accounting software may be needed. These organisations often customise their AIS to fit their specific needs and requirements.

2.7.22 Other Factors

User involvement in IT/information system development had also been listed as one of the elements in the critical success factors of the system implementation by Azizi et al. (2012), as well as one of the determinants of an effective information system implementation (Wiechetek, 2012). In the context of AIS, Choe (1996) had specifically examined user involvement towards the performance of AIS. He found a

significant positive relationship between the system's user's involvement in the system development and the performance of the system. The finding suggested that an increase in user involvement leads to an increase in the system usage, as well as user satisfaction. Similarly, McGowan and Klammer (1997) found employees involvement in ABC management implementation process is positively correlated with ABC management implementation success (i.e. based on satisfaction measurement). In contrast, Ismail (2009) assessed manager participation towards the AIS effectiveness and found an insignificant relationship between manager participation and the system's effectiveness. This contradictory result may be caused by a different level of users selected in their sample of study. Choe (1996) looked at all system users, regardless of their management level. On the other hand, Ismail (2009) focused on the manager level only. Additionally, a study on Venture Capital Investor (VCI) and AIS development by Mitchell et al. (1997), found that the external users of AIS (i.e. VCI) influence the investee's AIS. They found that the VCI involvement is highly important, especially in the early stages of the investee's AIS development.

Furthermore, the activity of comparing the organisation current system with other organisations' system has also been discussed as a critical success factor in the IT/information system field, such as the ERP. Shaul and Tauber (2013) and Ngai et al. (2008) presented this kind of benchmarking as the critical success factors in the ERP system based on their review of prior studies. Practically, having a benchmark from a good system and making comparisons with others is among the best ways to evaluate the status of the implemented system. Rapid changes in technology are often providing better ways of doing things. Therefore, without benchmarking, the

system's users and the organisation might think that their implemented system is the best. This may cause them to miss the competitive advantages offered by the advancement of technology within their industry.

2.8 IMPORTANCE-PERFORMANCE GAP

In the context of AIS, previous studies have discussed the alignment of the system in terms of the fit between the AIS requirements (i.e. information required) and the AIS processing capacity. Ismail and King (2005a) highlighted the importance of evaluating the AIS alignment in order to reveal its significant impact on organisational performance. Misalignment of the AIS indicates unnecessary investment towards the system or vice versa. For example, if the AIS processing capacity is higher than the information required by its users, it suggests that the organisation has overspent on the system. Alternatively, if the system is unable to provide the required information, that might affect the quality of decision-making (Ismail and King, 2005b). The concept of AIS alignment or fit measurement which was proposed earlier by Ismail (2004) has been adopted by other researchers to investigate the factors influencing the AIS alignment (Nabizadeh and Omrani, 2014; Hajiha and Azizi, 2011; Ismail and King, 2007). The AIS alignment is calculated using a moderation perspective, in which the AIS requirement scores are multiplied by the AIS processing capacity scores. High scores indicate highly aligned systems.

Adapting the idea of AIS alignment, it is interesting to reveal the condition (i.e. importance-performance gap) of each identified factor within the phenomenon of the critical factors of AIS effectiveness. Using the same technique of comparison (i.e. requirement versus capacity) in AIS alignment, the perceived importance and

perceived performance of each identified factors in the phenomenon can be used to evaluate the gap and strength of each factor. It is interesting to examine the importance-performance gap of each identified factor because the factors represent a combination of the organisation's resources (e.g. people and technology). The result is expected to derive a more practical strategic direction for the organisation. The organisational resources that combine human and technology factors offer a broader scope that cannot be concretely designed but can be directed with proper guidance and motivation.

Further reviews of the literature showed a way to assess the gap and strength of each factor by evaluating the importance and performance of those factors. This tool is known as the Importance-Performance Analysis (IPA) matrix. The IPA matrix was first proposed by Martilla and James (1977) from the marketing field. The matrix is used to assess customer satisfaction towards the elements in a marketing program. It is based on the concept of perceived importance of the attributes versus perceived performance of the attributes (Myers and Alpert, 1968). The technique has been widely applied by other marketing researchers, as well as researchers from other fields such as education, hospitality and tourism, service quality, leisure and tourism and healthcare marketing (Oh, 2001) as well as in transportation, banking, public management, telecommunication and E-government field (Charaf and Rahmouni, 2014).

In addition, the evidence of IPA matrix application can also be seen in the information system field, by authors such as by Cohen et al. (2016), Abeka and Abeka (2012) and Ainin and Hisham (2008). These studies focused on the information system's users' satisfaction by assessing whether the performance of the

system meets its users' expectations or requirements. The gap is assessed by comparing the important attributes of the system with its performance. Slightly different from most of the previous studies, Cohen et al. (2016) used a survey to obtain the *performance* scores and statistically calculate the *importance* scores using a Partial Least Square (PLS) approach instead of collecting it from a survey. The use of the statistical method to generate the *importance* scores has been argued to be more appropriate given the tendency of respondents to be biased (Cohen et al., 2016). However, the calculated score did not reveal the real opinion of the respondents on which examined attributes or factors they perceive to be important. In addition, the technique limits the opportunity to further understand the reasoning behind their opinion. A study in the accounting field by Charaf and Rahmouni (2014) used the IPA matrix to evaluate user's satisfaction towards Activity-Based Costing (ABC). Similar to the most popularly applied in previous studies, the *importance* and *performance* scores in their study were obtained from a survey based approach.

Generally, the IPA matrix is designed to assess satisfaction. However, this powerful tool is not just limited to measuring satisfaction. It has capabilities in deriving practical suggestions (Oh, 2001), determining the condition of attributes' performance (Wong et al., 2011; Scott et al., 2004, Oh, 2001; Mullins and Spetich, 1987), identifying the area to be focused on by management for a better resource allocation (Silva and Fernandes, 2011; Wong et al., 2011) and detecting areas that require urgent attention from the management (Cohen et al., 2016). The capabilities of the IPA matrix are somehow beneficial beyond satisfaction evaluation, if carefully applied. In addition, the technique allows identification of the needs for a particular attribute, which is useful for decision-making on future strategy (Charaf and

Rahmouni, 2014; Wong et al., 2011). Moreover, the IPA matrix is an easy and simple tool to implement (Charaf and Rahmouni, 2014; Wong et al., 2011; Oh, 2001; Mullins and Spetich, 1987). But, it should be noted that this tool is based on individual view towards the attributes and the result is not based on statistical examination. In other words, the comparison between the importance scores and the performance scores are descriptive based.

Nevertheless, its easiness, simplicity and outcome make it popular among the researchers who intend to measure satisfaction and condition or gap. The result of the IPA matrix is straightforward and visualised in a scatter plot graph format, making it clearer and easier to understand. Technically, the IPA matrix comprises of four quadrants. Figure 2.11 shows the IPA matrix.

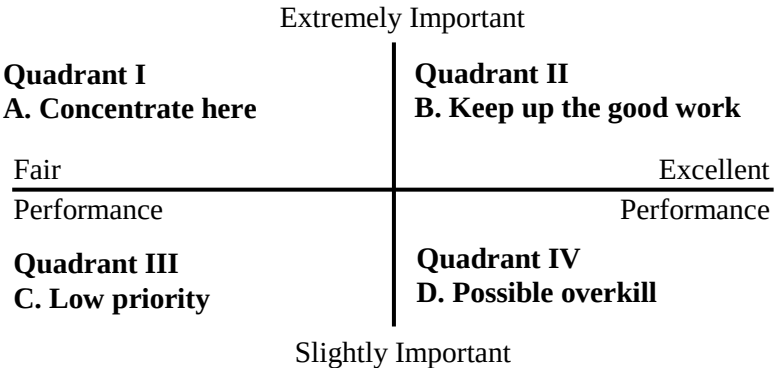


Figure 2.11: Importance-Performance Analysis (IPA) Matrix
Source: Martilla and James (1977)

The first quadrant, *Concentrate here*, shows an important attribute with a low performance suggesting an area that an organisation should focus on. The second quadrant, *Keep up the good work*, interprets a highly important attribute with a high performance, suggesting an area that should be maintained by an organisation. The third quadrant, *Low priority*, shows a less important attribute and low performance,

indicating a low priority area that need not be focused on by an organisation. The fourth quadrant, *Possible overkill*, interprets a low level of importance but performed well by the organisation indicating an area with resources that can be allocated to other areas that needed more attention. The presentation of the IPA result according to the four quadrants as suggested in the matrix is referred to for the discussion of the IPA results of this study (see Chapter 7, section 7.2.3, page 349).

Martilla and James (1977) suggested the use of median values for the central tendency of the *importance* and *performance* scale. However, if the median values are reasonably close to the mean values, 'use the means to avoid discarding the additional information they contain' (Martilla and James, 1977, p. 79). Furthermore, in determining the attributes to be measured, Martilla and James (1977) suggested exploration of the context of study in order to identify the potentially important attributes. In addition, Oh (2001) mentioned that it is desirable to get opinions from the targeted respondents in order to develop a set of strategically important attributes. For example, when investigating customers' perception towards a particular service, managers' opinions will be very useful and valuable in order to develop a more accurate set of attributes to be assessed.

2.9 SUMMARY

In summary, this chapter critically reviewed the definition of the main terms that are used in this study; namely information system, AIS and effectiveness. In addition, in depth reviews were performed on the existing measurements, evaluations, models and empirical studies related to information system, technology, ERP and AIS. Furthermore, this chapter provided a detailed discussion of the AIS including its

components, users of the system, the system effectiveness measurement, user satisfaction measurement and factors influencing the system. Moreover, apart from identifying the important factors influencing the AIS effectiveness, a review on the measurement used in previous studies to assess the condition of importance-performance gap for all items within the phenomenon of the critical factors of AIS effectiveness is also discussed briefly in this chapter. While investigating the factors that have influence on the AIS effectiveness is useful to identify the critical factors to be focused, assessing the importance-performance gap amongst the identified factors will be helpful in providing a direction for organisational strategic decision towards the allocation of resources that contribute towards system effectiveness. Chapter 3 now goes on to explain how the methodology for this study was developed, by reference to the literature review.

CHAPTER 3: RESEARCH METHODOLOGY AND METHODS

3.1 INTRODUCTION

This chapter explains in detail the methods and research design used in conducting the study. The view of reality and the preparation for conducting each of the methods and approaches are described accordingly. Specifically, this chapter elaborates on the qualitative and quantitative methods applied in this study including the population, sample and data analyses. Overall, this chapter consists of: the research paradigm; research design; research methods; and summary.

3.2 RESEACH PARADIGM

The research paradigm, which consists of ontology, epistemology, theory and methodology, is crucial in addressing the underlying research questions as well as producing useful research that contributes to knowledge development. Ontology refers to the way people perceive truth. Gruber (1993) discussed ontology as the way people perceive the world and the existence of reality. Whereas epistemology is about how people obtain or understand the knowledge of truthfulness (Bisman, 2010; Krauss, 2005). The epistemology assumption is shaped by the ontological view which leads to the methodology (Bisman, 2010; Xu, 2003). According to Bisman (2010), objectivist ontology is applied in much accounting research. The domination of the objectivist ontology also appears in information system research (Mingers, 2004a). More specifically, for several decades, the positivist paradigm has dominated accounting (Bisman, 2010) and information system research (Mingers, 2004a).

The positivism paradigm is also known as the scientific paradigm (Mack, 2010). Positivists perceive reality to be a single reality that is independent of them (Krauss, 2005). It is based on an assumption that reality can be predicted, generalised, described accurately and objectively, and explained causally (Bisman, 2010; Mack, 2010). In most cases, data collection within this paradigm is based on controlled methods (i.e. experiments and survey) (Mack, 2010). Discovering and verifying knowledge within a positivism paradigm is often conducted through direct observations or measurement of components involved in the phenomena being studied (Krauss, 2005). This paradigm offers minimisation of the researcher's bias, in terms of a separation between the object being studied and the researcher's thoughts and perceptions. As discussed by Bisman (2010), many of the prior studies in accounting seek: to develop hypotheses which are supported by prior theory or theories; to empirically test the hypotheses through statistical analysis; and to explain their findings based on a causal relationship between variables to confirm the applied theories. For example, several studies (e.g. Tamoradi, 2014; Nabizadeh and Omrani, 2014; Ismail and King, 2007) conducted on AIS seek to establish hypotheses and find causal relationship between variables that are supported by relevant theories (e.g. information processing theory) in prior studies. This paradigm is strong in terms of its ability to predict and establish hypotheses but is lacking in exploratory power and critical thought.

However, an increased volume in accounting and information system research activities and knowledge has shown growth in the adoption or application of other research paradigms. One such example is realism. The applications of a positivist paradigm in the accounting and information research have been

continuously debated among researchers. Limitations of the positivism stance became one of the issues for critics, specifically on the consensus of its weak empiricist position (Mingers, 2004a). It has been widely acknowledged that the AIS is important in assisting the process of accounting and supporting decision-making tasks. As the process of decision-making involves humans and their environment, the study of AIS requires a critical investigation not only in economic or financial information, but also in non-economic and non-financial information (i.e. behaviour and perceptions). The limitations of the positivist paradigm to broadly understand the phenomena being studied might limit the exploration to uncovering and discovering the tacit and explicit knowledge in this field. Thus, realism or its dominant paradigm, which is a critical realism, offers an alternative way of getting to the knowledge. The suitability of the critical realism paradigm to address a broad range of research questions in an accounting study has been described as the alternative research paradigm for the accounting field by Bisman (2010). On the other hand, Fox (2013) discussed the application of the critical realist paradigm in the scope of an information and communication technology study. He asserted the ability of this paradigm to improve the understanding of the causal mechanisms and context within the research focus.

Critical realism, as discussed by Bisman (2010, p.8), offers ‘a modified objectivist view’. It perceives reality as a single reality with multiple perceptions that are independent from a person’s mind and thoughts (Healy and Perry, 2000; Sayer, 2000). Ontology that lies within this paradigm is ‘in the sense that the one world contains many different kinds of entities’ (Mingers, 2004b, p.150). An event or phenomenon within this paradigm consists of entities that cause such event or

phenomenon to happen. As such, a deeper understanding of the entities surrounding the event or phenomenon is essential in order to produce a better explanation for the environment. In terms of epistemology, critical realism is distinct from positivism in the way that the critical realist seeks to uncover and discover the reality through an understanding of the contingent context in the environment that is imperfectly understood. The understanding of reality in critical realism extends the existence of the reality by undertaking a mechanism and process surrounding the reality. In the critical realism stance, there is no absolute reality as the reality cannot be wholly discovered (Krauss, 2005). Thus, the knowledge of reality within this paradigm is not to be proved or disproved. It is instead meant to understand the phenomena.

This paradigm is suitable for accounting (Bisman, 2010) and information systems (Fox, 2013; Mingers, 2004a), as both fields are managed by humans and related to the decision-making process. As such, understanding of human factors (e.g. behaviour) and their environment are important for comprehending the phenomena in the accounting and information systems field, as well as corroborating the knowledge with causal explanations.

In the context of this study, the critical realism stance offers an opportunity to explore a mechanism and a phenomenon, as well as providing a corroborative causal explanation (Easton, 2010). The critical realist world view seeks to identify a potential reality (Sayer, 2000) that allows the researcher to understand the reality, phenomena and environment as much as possible (Bisman, 2010). The investigation of the phenomenon of the critical factors of AIS effectiveness entails not only identification of the factors in prior studies, but also the discovery of the relevant factors in the current practices. Mingers (2004b) discussed the ability of this

paradigm to explore a wider knowledge than the positivism paradigm. The critical realism features are useful for gaining an explicit understanding of the complexity of accounting phenomena, as well as for generalising findings by corroborating the causal effect within the studied mechanisms (Bisman, 2010).

Furthermore, the population of this study is the Federal Government of Malaysia, which is known to have highly complex mechanisms surrounding its environment. According to O'Donnell et al. (2013), a multiple set of analytical approaches are required to comprehend the complexity within the phenomenon being studied. The understanding of the complexity within the context of study can also be achieved by other research paradigms, such as the subjectivist paradigm. However, one of the limitations of the subjectivist stance is a lack of generalisation for its findings. Generalisation might not always necessary, but most of the time it is needed for practice and policy improvement, which cannot be simply customised for the individual context (Bisman, 2010). On the other hand, a positivism paradigm also offers a generalisation of its findings. Nevertheless, the narrow focus of knowledge within the positivism paradigm might limit the understanding and exploration of some issues or phenomena. Smith (2006) discussed the limitation of the positivism paradigm to capture unobservable entities and causal process. Alternatively, the critical realism stance allows richer understanding of the environment, people, process, intangible and non-intangible information, and phenomena being studied. The generalisation of knowledge under the critical realist paradigm pertains to probable reality rather than absolute reality (Bisman, 2010).

Furthermore, the AIS operates through a combination of the organisation, humans and technology. Effectiveness of the system requires all of its components to

perform well. Thus, it is important to understand the multiple perceptions and processes surrounding the environment. This study perceived a reality in AIS effectiveness as a single reality which consists of multiple mechanisms and context. While positivism focuses on a single, concrete reality (Bisman, 2010), critical realism focuses on a single reality by taking into account the multiple perceptions of the reality (Healy and Perry, 2000). According to O'Donnell et al. (2013), positivism uses measurement to test developed hypotheses. On the other hand, the critical realist stance offers exploration of tangible and intangible phenomena in wider contexts including behaviour, perceptions and reaction of the people in the accounting field (Bisman, 2010). Moreover, the understanding of knowledge and the corroborating of research findings within the critical realism paradigm are more towards open systems (O'Donnell et al., 2013) in which the underlying assumption is not to be proved or disproved (Easton, 2010). In the context of this study, the critical realist stance extends flexibility in corroborating the research findings by providing a variety of ways (e.g. causal explanation) to get a good grasp on the on-going phenomena, rather than just based on a developed hypothesis. Mingers et al. (2013) highlighted the potential of a critical realism philosophical stance to understand the real problem and its underlying cause in current practices. The ability of the critical realist paradigm to interpret a complex or large-scale phenomena as compared to the positivist paradigm (O'Donnell et al., 2013) offers a better fit to answer the underlying research questions in this study.

Moreover, critical realism is compatible with a wide range of methods (Sayer, 2000), either quantitative or qualitative, mixed methods (Healy and Perry, 2000) or multiple methods (Bisman, 2000). The flexibility to apply several research methods

permits an exploration and in-depth understanding of the event or phenomenon. In addition, the application of multiple methods within this paradigm allows the establishment of coherent and consensus information or data, as well as findings (Bisman, 2010). Moreover, this paradigm allows a combination of multiple theories to reveal and obtain an explicit understanding of phenomena, as well as to provide room for theory development (Fox, 2013). Generalisation in critical realism that is obtained through corroborative findings resulting from coherence and consensus information or data, allows replication of the study for improvement in the applied theories (Bisman, 2010).

Principally, each philosophical stance has its own strengths and weaknesses that continue to be debated by researchers. Sayer (2000, p. 4) stated that 'following a philosophical argument is like negotiating a complex, twisting route through dense networks of street'. Different paradigms have different ways of viewing and understanding reality. Mack (2010) discussed the importance of identifying ontology before going further with understanding of the knowledge, as ontology will lead to epistemology and methodology. However, some researchers believe that there is no fixed way as all of the components in the paradigm will be developed simultaneously during the study.

In summary, this study views the phenomenon of the critical factors of AIS effectiveness from the stance of a critical realist. The methods applied to achieve the objectives of this study, which are multiple methods (i.e. qualitative and quantitative method), are used to discover a single reality about the on-going AIS practice by considering multiple perceptions from the actors within the phenomenon.

3.3 RESEARCH DESIGN

This study applies an abductive research design. Abduction is 'a cerebral process, an intellectual act, a mental leap, that brings together things one had never associated with one another' (Reichertz, 2004, p. 162). The abductive research design allows the research process to move backward and forward between induction and deduction (Morgan, 2007), as well as between data sets (Feilzer, 2010). This design enables richer findings to be discovered as the process is derived from a multidimensional perspective (Feilzer, 2010). As such, literature reviewed and data collected from the fieldwork of this study were re-visited many times during the process of this research. Figure 3.1 illustrates the research design of this study.

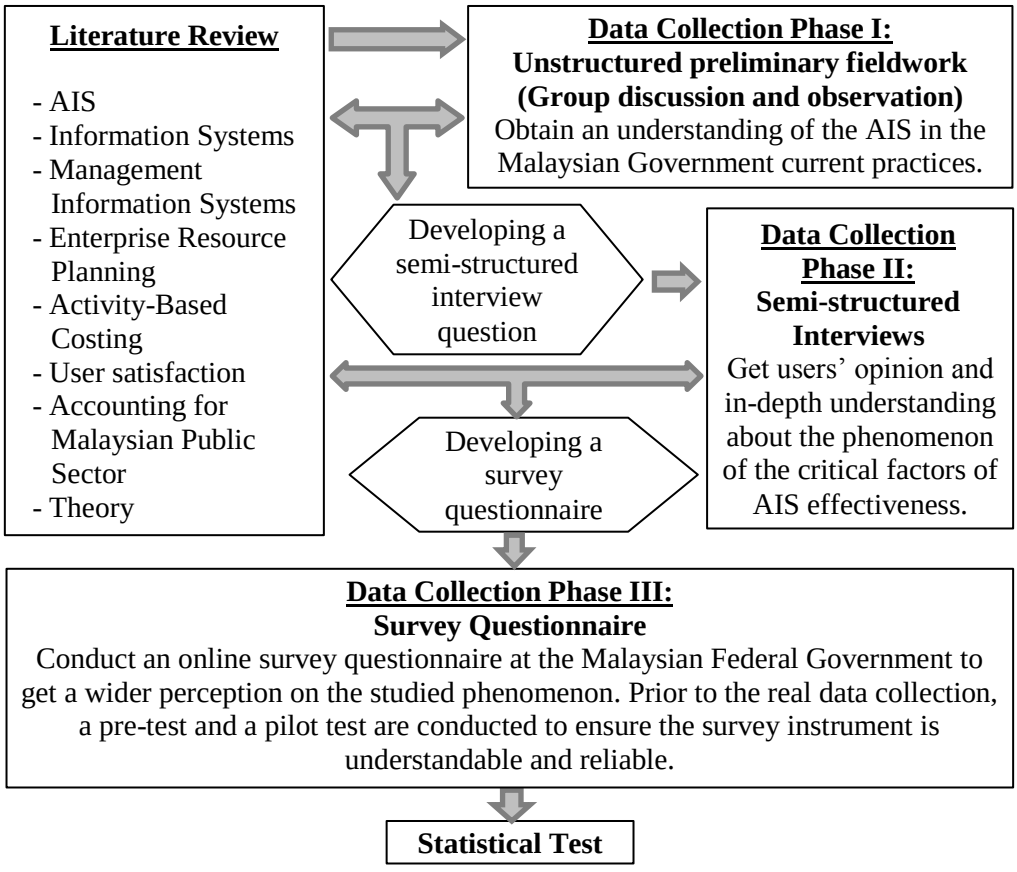


Figure 3.1: The Research Design

This study focuses on the Malaysian Federal Government, which consists of 24 ministries and a Prime Minister's Department. Each of these ministries has their own accounting office known as Self-Accounting Department (SAD). The fieldwork to explore the phenomenon of the critical factors of AIS effectiveness in this study was conducted in three phases. The focus started from specific divisions to a wider context. The specific divisions aimed to provide detailed information about the accounting operations and the AIS in the Malaysian Federal Government. On the other hand, the wider context was targeted to gain a general perspective about the AIS in the Malaysian Federal Government. Since the data collection of this study deals with people, ethical approval from the University of Strathclyde was sought prior to the data collection process. A support letter to conduct the fieldwork is attached in Appendix A. In addition, it is a requirement to apply for permission from the Malaysian Government to conduct the research in the Malaysian Government context. Thus, approval from the Economic Planning Unit (EPU) of the Prime Minister's Department was obtained accordingly. The approval letter from the EPU is attached in the Appendix B.

Prior to the data collection, reviews were undertaken of the prior studies about the determinants of AIS effectiveness, measurement for the effectiveness and the AIS studies related to the Government of Malaysia. Further reviews of information systems, Enterprise Resource Planning (ERP), data quality, information technology and implementation of system were also performed to enrich the findings of the factors affecting the system. The reviews were concurrently performed while conducting the fieldwork to enhance understanding of the context of this study.

As for the fieldwork, phase one was unstructured preliminary fieldwork that consisted of meetings and observation at the Malaysian Federal Government. The objective of this unstructured fieldwork was to gain an understanding of the AIS practices within the Malaysian Federal Government organisations. During this phase, an early discussion about the phenomenon of AIS effectiveness and the related factors affecting the system effectiveness according to the system's users' perceptions were sought. The unstructured fieldwork was conducted at the Account General's Department (AGD) and the accounting office of the Ministry of Finance of Malaysia. The preliminary findings from the unstructured fieldwork were used to enlighten the understanding of the system and to focus the direction of this study. In addition, the findings were used to develop the questions for the semi-structured interviews in phase two.

Phase two was semi-structured interviews that were conducted at the accounting offices of several ministries. The purpose of these interviews was to get an in-depth understanding of the AIS effectiveness and the phenomenon of the critical factors influencing the system effectiveness according to the system's users' perceptions and opinions. The findings from the unstructured preliminary fieldwork and semi-structured interviews, together with the output from the literature review, were used to develop a questionnaire for the next part of this research, which is the quantitative part.

The quantitative part, which is phase three of the data collection process in this study, used a survey questionnaire approach to collect primary data that is based on user's perception towards the identified factors and the AIS effectiveness. The

collected data was then tested using statistical tools in order to answer the research questions and to achieve the objectives of this study.

3.4 RESEARCH METHODS

This study uses multiple methods, applying both a qualitative and a quantitative method. Morse and Niehaus (2009) described multiple methods as the use of two or more methods (commonly qualitative and quantitative methods) in one study, in which one method is used after another to support or explain the findings from the former method. Both methods are conducted rigorously and standalone (Morse and Niehaus, 2009). For example, the findings from interviews are used to develop a survey instrument for the quantitative study. In the example, the interviews are conducted rigorously and its findings can be concluded with or without the subsequent survey. On the other hand, a mixed method approach is the use of a qualitative and a quantitative method (or other methods) in a way that both methods are intact in a single study (Morse and Niehaus, 2009). Mixed method research is designed for a comprehensive study, in which both methods are attached and cannot be separated to draw an independent conclusion.

Multiple methods are applied in this study to obtain a better understanding of the critical factors of AIS effectiveness in the Malaysian Federal Government practice and to enhance the existing instrument of the AIS effectiveness measurement and model. Multiple methods offer a wider and more comprehensive understanding of the phenomenon and context studied (Pinsonneault and Kraemer, 1993). In addition, having both methods to support one after another can also be considered as triangulation in research (Pinsonneault and Kraemer, 1993), in which

the quantitative data corroborate the qualitative findings, or vice versa (Pandit, 1996). In this study, the quantitative data is not just used to confirm the findings from the qualitative study, but also to get a better understanding of the phenomenon and to develop a better survey instrument that reflect, as close as possible, the current practice and tests it on a wider scale of participants. Pandit (1996) added that data obtained from multiple sources offers richer information and can improve validity and reliability of the construct or measurement proposed in the research model. Besides, an abductive research design (see section 3.3, page 126) that is applied in conducting the multiple methods used in this study allows in-depth understanding of the reality.

Furthermore, the application of multiple methods offers flexibility and variety of sample selection. The population of this study is the internal users of the AIS in the Malaysian Federal Government. The sample for this study focuses on the accounting personnel that use the AIS in doing their work. The targeted sample ranged from a specific group for the qualitative study to a wider group for the quantitative study. It is important to carefully consider the targeted groups of respondents in order to ensure the groups reflect the domain of the study (Thong and Yap, 1996). The sample selection also considered the personnel's willingness to participate and contribute in this study. Sampling for each stage of this study considered the targeted participant's or respondent's roles in the organisation (i.e. the participants are accounting personnel) in order to minimise the possible error and bias that might occur. Error or bias in surveys cannot be avoided, but it can be controlled (Fink, 2003). Controlling and minimising errors and bias in surveys can increase the reliability and validity of research findings.

3.4.1 Qualitative Method

The qualitative method in this study applies an unstructured preliminary fieldwork and a semi-structured interview approach. The unstructured preliminary fieldwork was conducted prior to the semi-structured interviews, in order to gain an understanding of the Federal Government of Malaysia, its AIS, operation and practice.

Furthermore, the semi-structured interviews were conducted to obtain specific information and opinion about the system. According to Turner (2010), interviews offer a richness of data that is derived from participants' perceptions and experiences. Specifically, semi-structured interviews allow researchers to ask the same key questions to each participant with the flexibility to add additional questions during the interview session (Arthur and Nazroo, 2003). Besides, the richness of answers from the interview may provide multiple views about the AIS, which are suitable in exploring the context and scope of this study.

Both fieldwork stages are focused on the accounting personnel that are involved with system planning and implementation, as well as using the system for managing data, transactions and various accounting functions such as analysis, reporting and so on. Administrative users that are solely responsible for inputting the data were not included in this study because they only use the system for transaction processing. Their narrow job scope may limit their opinions about the system.

Overall, the unstructured preliminary fieldwork and the semi-structured interviews were chosen because both offer greater opportunity to obtain valuable information. In addition, these approaches are suitable for the exploratory stage as it offers flexibility and the wider context to be studied.

i. Unstructured Preliminary Fieldwork

Due to the complexity of the Malaysian Federal Government's operations, an unstructured preliminary fieldwork stage was needed prior to the semi-structured interviews. The objective of this unstructured fieldwork was to gain a general understanding of the AIS practices, structure and environment surrounding the AIS in the Government. Discussions during the unstructured fieldwork were also useful for identifying the right personnel for the semi-structured interviews.

Although the preliminary fieldwork was conducted on an unstructured basis, a checklist was prepared according to the specific aspects to be explored, in order to ensure a sufficient understanding was gained. However, the checklist was not limited to the aspects listed. Any additional questions or aspects that were thought to be necessary were added during the unstructured fieldwork. The fieldwork was conducted through unstructured interviews and observation. Nevertheless, respondents' preferences were also considered. Other useful approaches were also taken into account in order to achieve the objective of this unstructured preliminary fieldwork. The checklist of aspects explored is listed in Table 3.1.

The unstructured preliminary fieldwork was conducted at the AGD. The AGD was established under the Ministry of Finance Malaysia before 1957. The AGD was chosen due to their roles as an organisation that is responsible for: developing and improving the accounting and its related systems (e.g. human resource management system); managing, monitoring and enhancing accounting related operations; and performing the enforcement of the Unclaim Monies Act 1965 for the Malaysian Government. The AGD also plays a role as a parent to all accounting offices in the Malaysian Government. There are 10 divisions under the

AGD. Each division has their specific roles and responsibilities related to the accounting services for the Government. Based on the roles and responsibilities of each of the divisions, four divisions were chosen for the unstructured preliminary fieldwork. The divisions are highlighted in Figure 3.2, illustrating the AGD organisation chart.

Table 3.1: The Checklist for the Unstructured Preliminary Fieldwork

Topic	Detail
i. General information about AIS	- Nature, function and objective. - Advantages and disadvantages. - Challenges.
ii. Operationalisation of AIS	- Various types of users and their responsibility. - Workflow of the system. - The system's integration with other eGovernment systems.
iii. Technology features	- Quality of the system (e.g. flexible, stable). - Technical issues related to the system functions and its solution.
iv. Effectiveness of the system	- Understanding of the definition and the criteria of an effective system. - Factors those are important in order to operate the system effectively. - Important actors (i.e. players of the AIS) in order to achieve the effectiveness of the system. - Operational issues related to the system.

Mainly, these divisions held responsibilities in: planning, monitoring and managing the accounting operations; performing accounting functions and producing financial reports for the Government; developing and managing the accounting system; managing the human resources needs related to accounting; enhancing the accountability of the Government; and providing consultancy services to the public sector in Malaysia.

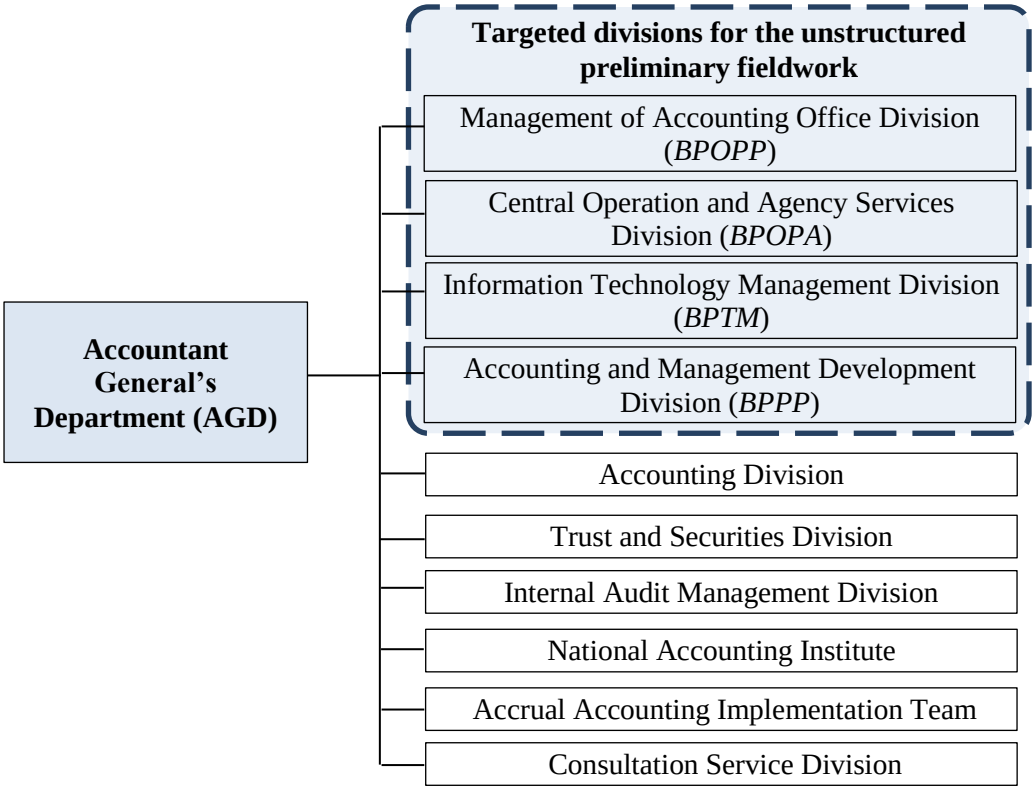


Figure 3.2: Organisation Chart of the Accountant General's Department of Malaysia
Source: portal.anm.gov.my

ii. Semi-Structured Interviews

The main purposes of the semi-structured interviews of this study were to gain opinions from the AIS users about their understanding of an effective system, perception towards the system performance and their needs in order to optimise the system performance. The system's users' understanding of an effective system aimed to reveal the criteria of system effectiveness. Meanwhile, the users' perception towards the system performance intended to discover about the effectiveness of the process function in the system. On the other hand, the users' needs in order to optimise the system performance reflected the important factors for the system to be effective.

The interviews were conducted with the accounting personnel at the accounting offices of several ministries. They held the position of chief accountants, deputy chief accountants and accountants, excluding accounting assistants and accounting clerks. They were chosen because they are considered to be well-informed personnel that have experience in the process function of the AIS (i.e. processing accounting data into information) and they use the information from the system to do their routine tasks including decision-making. These groups of people were also suggested during the unstructured preliminary fieldwork to be the most suitable personnel that have a better understanding of the AIS in terms of the system's objectives and applications. In addition to their knowledge of the system's process and function, they are also familiar with the system's operations and performance. Moreover, they are an important actor for connecting any related matters between the responsibility centre and the AGD. Thus, their opinions concerning the system are highly relevant to the scope of this study.

The semi-structured interview questions were developed based on the findings from the unstructured preliminary fieldwork and the instruments used in previous studies (e.g. Appiah et al., 2014; Fang and Patrecia, 2005; Xu, 2003). In addition, the seven guidelines suggested by Cameron and Whetton (1983) were also referred to when refining the existing questions in the literature, for the AIS effectiveness measures of this study. Table 3.2 shows the application of the seven guidelines used in this study. The complete set of questions for the semi-structured interviews are presented and discussed in detail in the next chapter (i.e. Chapter 4, section 4.5, page 182).

Table 3.2: The Application of Seven Guidelines by Cameron and Whetton (1983) in Assessing AIS Effectiveness

Guideline	Applied in This Study	Interview Question
i. From whose perspective is effectiveness being judged?	AIS users that used the system to manage and process accounting data and information.	What is your (interviewee) role in the organisation?
ii. On what domains of activity is the judgment focused?	AIS process from input, to output.	What are the objectives of the AIS in your organisation?
iii. What level of analysis is used?	Individual perception/opinion.	-
iv. What is the purpose of the assessment?	To evaluate AIS effectiveness based on user satisfaction towards the system.	How will you define the effectiveness of the AIS in your organisation? What are the criteria of an effective AIS?
v. What time frame is employed?	Periodically depending on the activity performed. Input and processing activity requires users perception based on their experience using the system in daily basis. On the other hand, output and impact gained on daily, monthly, quarterly or yearly basis.	-
vi. What types of data are sought?	Subjective, in which user perception and opinion are used.	-
vii. What is the referent against which effectiveness is judged?	User expectation towards an effective AIS.	What do you expect from the system in order to satisfy your requirements? What do you want from the system?

Source: Adapted from Cameron and Whetton (1983) in Cameron (1986, p. 93 & 94) for this study

Population for the Semi-Structured Interviews

The population for the qualitative part of this study focuses on the internal users of the AIS at ministry level of the Malaysian Federal Government. For example, the internal users of AIS are accountants, auditors, government officers and politicians. However, this study intends to assess the effectiveness of the system in managing, processing and producing information. Therefore, the internal users for this qualitative study concentrate on the personnel that use and work with the system. As such, the population of the qualitative part, semi-structured interviews, for this study consists of the accounting personnel in the accounting offices at all ministries. Approximately, there are 1,037 accounting personnel throughout 24 ministries and a Prime Minister's Department. The information was obtained from the website of each ministry in July 2015 prior to the data collection process.

Sample for the Semi-Structured Interviews

A sample is a portion that represents the population (Fink, 2003). The sampling technique to be chosen often depends on the purpose of a study. Usually, the purpose of a quantitative study is to generalise its findings. As such, the chosen sampling technique should be able to achieve the intended purpose. In most cases of quantitative studies, the sample is larger in terms of the number of observations. On the other hand, in a qualitative study, the researcher is commonly looking for a rich and in-depth understanding about the phenomenon being studied. Thus, the sample is often smaller, as compared to a quantitative study, and the findings tend not to be generalised.

In a qualitative study, having too much data may mean it takes the researcher years to analyse it (Ritchie et al., 2003). In addition, getting too much qualitative data will make the data unmanageable, broad and messy because different people have different views about a reality. Ritchie et al., (2003) asserted that the quality of findings in a qualitative study for a large sample size, for example, above 70 datasets, may be questioned, therefore, the researcher should carefully consider the analysis to be carried out in order to gain in-depth understanding with such a large sample size. On the other hand, they added, if the sample size is too small, key personnel might be missed and the exploration of the domain of study might be limited. Hence, having the specific criteria of a respondent to be selected, even in a small sample size, is helpful in order to have a good understanding about the context of study.

As for the qualitative part of this study, a purposive sampling technique was applied for the semi-structured interviews. Purposive sampling is one of the sampling techniques in non-probability sampling. This technique refers to an individual or a group of people that are selected based on their particular demographics (e.g. background and experience) that will enable exploration and in-depth understanding about the context of study (Guest et al., 2006; Ritchie et al., 2003). The specific criteria or characteristics that the selected respondents have are believed to be useful in achieving the objectives of the study. In addition, the purposive sampling technique aims to ensure the selected respondents are relevant to the matter to be explored with some diversity in terms of the concerned criteria or characteristics, so that the phenomenon can be pictured better (Ritchie et al, 2003).

Therefore, the sample of semi-structured interviews of this study is focused on the top and middle management level at the accounting offices that used the AIS

to process and produce information, as well as using the information for decision-making at the ministry level. According to Fink (2003), sampling is useful on the basis that it helps the researcher to focus on certain characteristics that are believed to bring meaningful elements to the study rather than examining the whole population. For example, the lower level of management in the accounting division may only have a little information about what they want from the AIS because their intention in using the system is too specific, such as keying in a purchasing transaction. Thus, the accounting personnel from top and middle management levels are believed to have a wider view of the AIS in their organisation because they have more responsibilities, as well as broader access to the system. According to Wiechetek (2012), a manager often has a better vision about the implemented information system as compared to his or her subordinates.

Specifically, the accounting personnel have to meet at least two basic criteria in order to be sampled for this qualitative study: (i) have access to any of the accounting systems, which are GFMAS, *eSPKB* and *eTerimaan*, (ii) use the system to retrieve and process data for further action (e.g. reviewing and approving accounting transactions), and produce accounting information.

At present, there are 24 ministries and the Prime Minister's Department in the Malaysian Federal Government. In a qualitative study, the guidelines about the sample size are not as firm as a quantitative study. There are various recommendations about the minimum sample to be obtained in a qualitative study. One of the recommendations is to stop when theoretical saturation is reached (Guest et al., 2006; Gillham, 2005). Saturation refers to a situation 'when no new data are emerging' (Corbin and Strauss, 2008, p. 143). The minimum sample to reach the

saturation may vary from one study to another. Guest et al. (2006) found saturation can be sooner achieved in a small sample size through having a set of characteristics and criteria for respondent selection. Based on their findings, they suggested that six to 12 interviews are sufficient to derive a meaningful understanding and to interpret in a homogenous context. This is consistent with Corbin and Strauss (2008) in which they mentioned that less than six of one hour interviews might not be rich enough to reach saturation level. In addition, cost, time and procedure to get access to the targeted respondents should also be considered. Furthermore, it is important to understand the nature of the work done by an accountant, especially at top management level, who must stick to a tight work schedule. As such, their participation in this interview also depended on their willingness, readiness and availability.

iii. Qualitative Data Analysis – Coding

A code in a qualitative analysis is commonly referred to as 'a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data' (Saldaña, 2013, p. 3). The same data might be coded and interpreted differently by different people due to the differences in points of view that are held by each person. In addition, the different codes and interpretation also depend on the context of the study. For example, the observational note about an employee browsing a social media website during working hours can be coded as misusing organisation's equipment or inefficiency of employee or discipline issue. It depends on the context and objective of the research that is being conducted. The code in qualitative data is commonly grouped and

themed accordingly into categories in order to improve the findings, as well as for a better structure. The technique of grouping or organising the similar coded data is called coding (Saldaña, 2013). 'Coding provides a means of purposely managing, locating, identifying, sifting, sorting and querying data … to stimulate and facilitate analysis' (Bazeley, 2013, p. 125). Coding is one of the useful ways of organising and managing qualitative data in order to draw analysis and lead to research findings (Saldaña, 2013). Coding is often repeated several times, which is also known as re-coding.

However, coding qualitative data is sometimes demanding and researchers can drown in the volume and complexity of their data. Discussion and interview transcripts are often loaded with data that are based on people's opinions, in which a coding technique offers a way to manage the data and to uncover the meaningful information (Bazeley, 2013). Researchers can sometimes find themselves lost in the richness of the qualitative data. Thus, researchers are recommended to outline their research objectives and research questions before they start coding and periodically review the codes while coding, so that the objectives are achieved and the questions are answered accordingly (Bazeley, 2013). Nevertheless, having the research objectives and the research questions should not limit the researchers' focus, but, rather help to direct the codes to the context of study and concurrently explore other meaningful information. Saldaña (2013, p. 22) recommended researchers to ask themselves a question of 'What strikes you?' during coding and data analysis, in order to uncover meaning from the qualitative data.

There are many types of coding. Among all of the available types of coding, Saldaña (2013) asserted six types of coding as grounded theory coding canon, which

are *in vivo* coding, *process* coding, *initial (open)* coding, *focused* coding, *axial* coding and *theoretical (selective)* coding. These types of coding are not only used in grounded theory studies, but are also popular in non-grounded theory studies, especially those that are commonly applied by beginners in the qualitative research field, such as *in vivo* and *initial (open)* coding. On top of that, there are also other types of coding that are usually used to code interview, observation and discussion transcripts such as *simultaneous* coding. *Simultaneous* coding is appropriate to be applied when the data contains more than one meaning. It is normal in real data collection practice for an opinion to have various meanings because the way people deliver their opinion is flexible. Therefore, one piece of data may suggest more than one meaning. Table 3.3 describes some of the commonly applied coding types as explained in Saldaña's (2013) book, *The Coding Manual for Qualitative Researchers*.

Table 3.3: Description of Several Types of Coding

Type of Coding	Explanation
In Vivo	Is an abbreviation of 'in that which is alive' (p. 91). Codes are extracted from a participant's own words.
Process	Coding the conceptual action.
Initial (Open)	Open-ended coding by breaking the data content and examining the differences and similarities.
Focused	Categorising codes into categories based on similarity between them, either conceptually or thematically.
Axial	Exploring the relationship between categories or dimensions that have been coded.
Theoretical (Selective)	Identifying core category or primary theme, concept or context to draw a clear idea from the qualitative data.
Simultaneous	Applying multiple codes to a single passage of text or overlapped between codes.

Saldaña (2013) perceives coding to be a cyclical, rather than a linear, process. The process commonly starts with wider to narrower contexts. Saldaña (2013) categorised *in vivo*, *process* and *initial (open)* coding as first cycle coding methods. On the other hand, *focused*, *axial* and *theoretical (selective)* coding are categorised as second cycle coding methods. There is no concrete rule about the best way or best type of coding that should be applied. It depends on the nature of study or the type of qualitative data. Some types of coding can be mixed and matched whenever appropriate in order to draw good information for further analysis (Saldaña, 2013). In the context of this study, several coding types were considered suitable for application: *initial (open) coding*; *in vivo coding*; *simultaneous coding*; *focused coding*; and *axial coding*. The process of coding performed for this study is further explain in Chapter 4, section 4.3.1, page 164.

3.4.2 Quantitative Method – Survey Questionnaire

There are many ways to collect data when using a quantitative method. One of the most applied ways is a survey questionnaire. This is suitable, especially in the case of obtaining a large volume of opinions and perceptions. This approach offers an opportunity to get a wider range of views due to the number of respondents.

A survey questionnaire, in which a respondent has to complete the survey on his or her own, is also known as a self-administered questionnaire. This type of questionnaire can be done for minimal cost with a high response rate, if appropriately conducted (Dillman, 2000). However, careful consideration in developing the survey instrument and its implementation should be taken to avoid cost overrun, a low response rate, a lengthy collection duration period and unreliable data. According to

Dillman (2000), there are four sources of survey error that should be treated accordingly to minimise the error. Out of the four sources of the discussed survey error, Dillman (2000) stressed more attention on the measurement and nonresponse error because both can be greatly managed if careful consideration is taken during the questionnaire design and the survey implementation stage. The details about the survey error sources are explained in Table 3.4.

Table 3.4: Four Sources of Survey Error

Source of Survey Error	Explanation
i. Sampling error	- The result of surveying only some, and not all, elements of the survey population.
ii. Coverage error	- The result of not allowing all members of the survey population to have an equal or known nonzero chance of being sampled for participation in the survey.
iii. Measurement error	- The result of poor question wording or questions being presented in such a way that inaccurate or uninterpretable answers are obtained.
iv. Nonresponse error	- The result of people who respond to a survey being different from sampled individuals who did not respond, in a way relevant to the study.

Source: Dillman (2000, p.11)

Therefore, this study applied a survey based questionnaire method for the quantitative part. The survey was conducted in continuity with the qualitative part of this study. The purpose of the survey is to get a broader view about the context of this study from the system's users who are involved in processing the accounting data and producing it into information.

In today's world, the advancement of technology has offered more benefits to the self-administered questionnaire technique (Dillman, 2000). People are now connected through technology anywhere and at any time. Especially in a working environment, most organisations are now equipped with computers and internet

access that provide a connection to the outside world. In the context of this study, the AIS of the Malaysian Federal Government depends heavily on technology. Thus, the use of computers among employees and access to the internet is common. In practice, almost all Government officers are equipped with a personal computer or laptop. Hence, the staff capability in using the basic functions of computers and accessing the web browser through the internet is no longer a major problem. As such, an online survey questionnaire is suitable for this study. According to Dillman (2000) internet surveys are efficient in terms of cost, time and offer variety of design. The online survey can be conducted internationally as long as the targeted respondents have a computer and internet access. The researcher no longer has to travel in order to reach the targeted respondents or the questionnaire is no longer required to be mailed to the respondents. In addition, most of the available software provides bank questions or templates that make it easier for the researcher to design the questionnaire and make it more interesting with pictures, animations and videos.

In this advanced technology era, the ability of the targeted respondents to respond through the online survey should not be a problem with user-friendly software that is largely available through the internet. There are number of online survey applications available such as SurveyMonkey, Qualtrics, SurveyGizmo, Zoomerang and many more. These types of applications offer not only a platform to implement a survey, but also a tool to develop the questionnaire and make it more convenient for the respondent to respond.

i. Questionnaire Development

The questionnaire was developed based on a combination of the available questionnaires in prior studies (e.g. Cohen et al., 2016; Komala, 2012; Rahayu, 2012; Ismail, 2009; Ong et al., 2009; Ismail and King, 2007; Ifinedo, 2006; Chang and King, 2005; de Guinea et al., 2005; Xu, 2003; Rai et al., 2002; Chin and Lee, 2000; Thong et al., 1996; Doll and Torkzadeh, 1988) and the findings from the qualitative part of this study that reflected the Malaysian Government practices.

The developed questionnaire comprises of three sections: the AIS effectiveness; the critical factors of AIS effectiveness and its antecedents; and the respondent's profile. Each of the sections is intended to provide meaningful information for the analysis in this study. Therefore, a multiple-item measure was applied to enable in-depth analysis on each of the proposed variables. Alternatively, a single item measure can also be used to evaluate variables. However, a single item measure provides limited information (Ives et al., 1983) and sometimes can be too general for the dimension or variable. In addition to that, a single measure often means overlooking key information with regards to the respondent's opinions. For example, a respondent's score on overall satisfaction towards the system quality does not suggest which part of the system quality it is that satisfies him/her, or indeed why the respondent is giving that rate. Torkzadeh and Doll (1991) suggested that multi-item measures focusing on specific applications are more likely to increase the reliability of the survey instrument.

The AIS effectiveness section was divided into three dimensions: system quality; information quality; and benefit/usefulness of the system. All sub-sections require the respondents to rate their level of satisfaction towards each item stated in

the section. The satisfaction level was ranked based on five-point Likert-scale from very dissatisfied to very satisfied, with middle scores of neither satisfied nor dissatisfied. The total number of items in this section was 13, before it was refined to 10 after the pre-test and pilot test of the questionnaire. The items were developed based on the findings from the qualitative part of this study, as well as the prior studies instruments or survey questionnaires. Duplication of wording and statement of the questions from previous studies (e.g. Cohen et al., 2016; Sacer and Oluic, 2013; Komala, 2012; Rahayu 2012; Ismail, 2009; Ong et al., 2009; Ifinedo, 2006; Xu, 2003; Rai et al, 2002; Thong et al., 1996), especially instruments that have been commonly used and tested with high reliability, were made as similar as possible, with some modifications to fit in with current practice. Some of the questions were created for this study based on the findings from the unstructured preliminary fieldwork and the semi-structured interviews, such as the ability of the system to produce a report in the required format and the integration between the systems in the Government. These items have actually been discussed in prior studies in terms of its importance. Some other studies included these items in their instrument in a different aspect of the AIS, such as an integration between the AIS and the business activities (Sacer and Oluic, 2013), information characteristics in details (Ismail, 2004) and a separate measurement of information quality for relevancy and completeness (Rahayu, 2012). Thus, this study tends to measure the items in terms of user satisfaction level.

On the other hand, the critical factors of AIS effectiveness and its antecedents consist of three sub-sections that are defined based on three categories of factors. The categories are people, organisation and technology. All categories used five-point

Likert-scale with side-by-side measurement for perceived importance and perceived performance. The respondents were required to rank: the level of importance, from not important to very important; and the level of performance, from poor to excellent. There are a total of 33 items of question for this section. The development of the items were based on the questionnaires and findings from previous studies (e.g. Zhang et al., 2013; Rahayu, 2012; Xu, 2003), as well as the findings from the qualitative part of this study.

Furthermore, the respondent's profile section consisted of 11 questions. Mainly, this section requires respondents to provide several details about themselves, such as gender, age, education, qualification and employment background. The age question was constructed based on age group (e.g. age 21 – 30) to avoid inconvenience for some respondents that might feel sensitive about revealing their specific age. In addition, the qualification of educational background was created to ask whether the respondent's education is solely in the accounting field or vice versa or mix (i.e. accounting field and other fields). In addition, they were required to state their highest level of education, professional qualification and membership of any professional body. In terms of work related information, the respondents had to state the background of their department: a newly appointed SAD; or an existing SAD; or the responsibility centre. Questions specifically focused on the respondents' employment details, position and grade were also asked. However, these questions were optional because some of the respondents might prefer not to give these details. Furthermore, they were asked to provide the details of their experience in using the AIS software and their number of years working in the Government, as well as in private sector, if any.

Overall, each of the proposed factors was measured using several items or indicators, to increase the accuracy of the dimension measurement and to reduce measurement error as suggested by Hair et al. (2014). The items for each factor and each dimension were developed to measure the proposed factors and dimensions in detail, rather than generally. For example, *knowledge* was composed of four items that asked about the system's user's understanding of the accounting standards and the AIS, an academic qualification, and experience. In addition, the five-point Likert-scale was label accordingly (e.g. dissatisfied, satisfied and very satisfied) instead of using a score. The quality of survey data is suggested by prior studies to be better with a labelled scale instead of a score (Visser et al., 2000). The final questionnaire is presented in Appendix C.

ii. Questionnaire Refinement

Adopting a well-developed questionnaire is good as it has already been tested in prior studies. However, due to limited comprehensive studies on AIS effectiveness, especially in the government sector, the questionnaire in this study required modification of previously used instruments. In addition, the questionnaire should also consider the additional items specifically developed according to the suggestions from the qualitative findings, in order to reflect the current environment and practices of the Malaysian Federal Government. Therefore, caution must be taken with the new instrument to ensure the questions in the instrument reflect the context of study.

According to Bourque and Fielder (2003), pre-tests and pilot tests are helpful in improving the validity and reliability of the questionnaire prior to actual data collection. It is common to revise the questions several times in order to have a good

questionnaire (Dillman, 2000). Refinement of the questionnaire is important in order to improve the appearance of the questionnaire, make it interesting to be completed, reduce the respondent's feeling of burden in completing it and make them feel worthy of participation. Pre-tests and pilot tests allow the researcher to detect multiple problems and errors related to the questionnaire before it is launched (Bourque and Fielder, 2003). Information gained from the pre-test and pilot test can be useful as it helps the researcher to plan for the actual data collection process. Dillman (2000) suggested that the questionnaire can be tested not only on the population of study, but also on the different groups of people from other fields, prior to survey distribution. Having a good questionnaire is a way to minimise measurement error (Dillman, 2000). As such, this study conducted several tests before launching the survey. The tests are a pre-test, a pilot test and a final check.

Pre-test Survey

Pre-testing is useful to detect any errors and ambiguity in the questionnaire, as well as to improve the understandability of the questions (Bourque and Fielder, 2003; Visser et al., 2000). Dillman (2000) summarised a pre-test as an evaluation of the questionnaire through getting feedback from others, in order to improve the questions and its structure before the questionnaire is ready to be distributed.

Pilot Survey

Pilot survey is useful in order to carefully plan for the main data collection, as well as to identify any changes that are required before the actual survey (Calder, 1998). In addition, pilot survey provides a practical idea on how to effectively access the

targeted respondents. The result of the pilot survey offers a pattern of respondents' answers. The pattern of their answers provides a preliminary overview of the reliability and validity of the questions in the questionnaire instrument. In addition, respondents' comments from the pilot study are also helpful in improving the questionnaire instrument prior to actual data collection.

Final Check

Finally, the questionnaire was again tested for final check. Dillman (2000) suggested that the final check should be performed by asking people not involved in the development of the questionnaire. Dillman (2000, p. 147) added, 'people who have worked on one revision after another soon lose their ability to detect obvious problems'. Thus, performing the final check will be helpful to ensure that the questionnaire instrument is ready to be distributed.

iii. Population for the Quantitative Study

The population for the quantitative part of this study is the internal users of AIS in the Malaysian Federal Government. Internal users in this study refer to the Malaysian Federal Government employees that directly interact with the system. The users comprise of various management levels from the accounting office at the ministries and the responsibilities centres throughout the country. Specifically, the population is focused on the Malaysian Federal Government employees that are involved in processing the accounting data into information through the system. In the Malaysian Government context, the accounting personnel are graded under code 'W'. There are approximately 5,254 accounting personnel employed at grade W in the Malaysian

Federal Government. This figure was obtained from the Accounting and Management Development Division of the AGD in April 2016. The obtained figure comprises of: the group of top management; the group of management and professional; and the group of support staff. However, not all grade W personnel are assigned to accounting tasks and allocated to an accounting office. Some of them are allocated to the finance and audit departments. Besides, some grade W personnel are located at the top management office doing strategic planning, special collaboration, knowledge development and so on. Moreover, their position is rotated every three or five years. For example, accounting personnel in the accounting office can be assigned to the top management office for special collaboration tasks, and vice versa. Therefore, the exact number of the AIS users that play a role as a producer of accounting information is difficult to obtain.

iv. Sample for the Quantitative Study

As explained previously in section 3.4.1 (ii) – *Sample for the Semi-Structured Interviews*, page 137, sampling is helpful in narrowing down a population into a targeted group of people who best describe the population. The targeted respondents should be carefully determined so that their opinions reflect the real phenomenon (Pinsonneault and Kraemer, 1993).

The primary objective of a sample survey is to represent its population. Therefore, it should be possible to generalise the sample (Levy and Lemeshow, 1999). Hence, the minimum sample should be calculated carefully. Due to the unknown number of the exact total of population, the rule of thumb suggested by Hair et al. (2014, 2017) is considered. According to Hair et al. (2014, 2017), the

minimum sample is equivalent to a maximum of total arrows pointing to any latent variable in the research model multiplied by 10. In the context of this study, the maximum number of arrows pointing to a variable (i.e. *Monitoring and Review* variable) is 5. Thus, following the minimum sample suggested by Hair et al. (2014, 2017), a sample of at least 50 must be collected.

Given the hierarchical structure of the Malaysian Government organisations, the best way to get access to the targeted respondent is using a gatekeeper. In addition, formal approval must be obtained from the Economic Planning Unit under the Prime Minister's Department of Malaysia prior to the survey distribution. Contact information of all chief accountants was obtained from the website of each ministry. A formal invitation for the survey was sent through email to all chief accountants. Each of the chief accountants nominated a staff to assist in distributing the survey questionnaire within their ministry. The use of the nominated staff as a gatekeeper in this study is not only seen as a courtesy in gaining access, but also to improve sampling coverage as they have the updated list of the accounting personnel in the ministry. An email containing the online survey link was sent to the gatekeeper together with a consent letter to be forwarded to all accounting personnel within the ministry. A complete list of ministries and the gatekeepers' details are well maintained for further reference and follow up.

Non-probability sampling was used in this study. As the survey was distributed through the gatekeepers, total questionnaire distribution is unknown. Based on previous studies, 40% response rate from the total distributed questionnaire is preferable. Therefore, the survey was expected to be distributed to at least 125 targeted respondents in order to collect the minimum of 50 completed questionnaires

suggested by Hair et al. (2014, 2017). Generally, a response rate of 25% to 40% is commonly accepted in prior studies related to AIS in Malaysia, such as Ilias and Zainudin (2013) – 37%, Ismail (2009) – 32%, Ismail and King (2007) – 29% and Ismail and King (2005a) – 25%. Other prior studies in the AIS field from various countries reported a response rate about 20% to 60%, such as Fitriati and Mulyani (2015) – 59.3%, Daoud and Triki (2013) – 56.4%, Pierre et al. (2013) – 49%, Saleh (2013) – 41.4%, Tijani and Mohammed (2013) – 57% and Pornpandejwittaya (2012) – 23.8%. A review of management information system studies conducted by Pinsonneault and Kraemer (1993) summarised that almost half of the reviewed papers had a response rate below 51%. Similarly, Visser et al. (2000) asserted that self-administered surveys, especially mailed questionnaires, commonly reported a response rate below 50%.

However, the response rate estimation may not be accurate in the context of this study because the number of questionnaires distributed is unknown. Moreover, a total of 50 respondents are too low to represent all the system's users in the Federal Government of Malaysia. Alternatively, the rule of thumb provided by Cohen (1992) was followed. Based on Cohen (1992), when a maximum number of arrows pointing at a variable (i.e. *Monitoring and Review* variable) is five, the minimum sample size required is 169 observations to achieve a statistical power of 80% for detecting R^2 value for at least 0.10 with a 1% probability of error.

In the context of this survey, the targeted respondents were the accounting personnel (i.e. grade W) in the accounting office at the ministry level and the responsibility centres throughout the country. The unit of analysis was the accounting personnel that are involved with processing and producing the accounting

information using the system, excluding administrative and clerical staffs. Administrative and clerical staffs were excluded because their experience was limited to certain system functions only (e.g. keying in data) which may limit their opinion towards the system. Basically, the criteria of the targeted respondents were as follows;

i. User of AIS.

ii. Have access to any of accounting-related systems in the Malaysian Federal Government, which are GFMAS, *eSPKB* and *eTerimaan*.

iii. Involved in any kind of processing function in the AIS, such as being responsible for reviewing the keyed in data, involved in retrieving data and processing it into information, responsible for approving some transactions etc.

v. Quantitative Data Analysis

Partial Least Squares Structural Equation Model (PLS-SEM)

Partial Least Squares Structural Equation Model (PLS-SEM) is a type of multivariate analysis. Multivariate analysis refers to 'the application of statistical methods that simultaneously analyse multiple variables' (Hair et al., 2017, p. 2). PLS-SEM aims to maximise the explained variance (i.e. R^2 value) of the dependent variables in the research model (Hair et al., 2017, 2014; Hair et al., 2011; Lee et al., 2011). Its estimation is calculated using Ordinary Least Squares (OLS) regression (Lee et al., 2011). The PLS-SEM technique is often labelled by researchers as a second-generation technique. Another second-generation technique is Covariance-Based Structural Equation Model (CB-SEM). Both techniques (i.e. PLS-SEM and CB-

SEM) offer more sophisticated tools in analysing data to overcome the weaknesses in the first-generation technique (Hair et al., 2017). The first-generation techniques commonly refer to cluster analysis, exploratory and confirmatory factor analysis, multidimensional scaling, analysis of variance, logistic regression and multiple regression. Each technique, PLS-SEM and CB-SEM, has its own strengths and weaknesses. Hair et al. (2017, p. 23), adapted from Hair et al. (2011), outlined the guideline for choosing the most suitable technique as shown in Table 3.5.

Table 3.5: The Guideline for Choosing between PLS-SEM and CB-SEM

Use PLS-SEM when	Use CB-SEM when
- The goal is predicting key target construct or identifying key "driver" constructs. - Formatively measured constructs are part of the structural model. - The structural model is complex. - The sample size is small and/or data nonnormally distributed. - The plan is to use latent variable score in subsequent analyses.	- The goal is theory testing, theory confirmation, or the comparison of alternative theories. - Error terms require additional specification, such as the covariation. - The structural model has circular relationships. - The research requires a global goodness-of-fit criterion.

In the context of this study, PLS-SEM was applied to analyse the quantitative data. PLS-SEM is a nonparametric method. This technique visually draws the relationships between variables, as well as specific criteria that are used to measure the variables in a diagram known as a path model. Variables in the path model are known as constructs and specific criteria that are used to measure the construct are known as items or indicator items. Path model is formed by two elements, which are a measurement model and a structural model. Measurement model refers to relationships between indicator items and its particular construct. On the other hand, structural model refers to relationships between constructs (i.e. variables). There are several choices of software available to run the PLS-SEM such as VisualPLS,

SPAD-PLS, XLSTAT's PLSPM, PLS-GUI, WarpPLS and SmartPLS. Hair et al. (2017, p. 86) stated that, 'to date, SmartPLS 3 is the most comprehensive and advanced program in the field'. Hence, SmartPLS 3 was used to run the analysis of the quantitative data.

PLS-SEM is suitable for use in this study for several reasons. First, this study was exploratory in nature, in which the measurements of proposed variables were obtained from the qualitative data of this study, alongside the literature reviews. This study aimed to statistically identify a comprehensive measurement of AIS effectiveness as well as the phenomenon of its critical factors. Specifically, the exploration of the AIS effectiveness measurement in this study was applying the Hierarchical Components Model (HCM) analysis. The AIS effectiveness measurement was constituted (i.e. formative) by three dimensions, which are system quality, information quality and the benefit/usefulness of the AIS. On the other hand, the measurement items for each dimension were reflective measures. In other words, the HCM analysis was combining the reflective and formative measures in the research model. Therefore, PLS-SEM is suitable to be used as it allows reflective and formative measures in one path model (Ringle et al., 2012; Hair et al., 2011). Second, the structural model was complex as it consisted of the antecedents for the critical factors, the critical factors, AIS effectiveness and a moderator variable. The dimensions in the AIS effectiveness were treated as three dependent variables (i.e. reflective based measures) prior to HCM analysis. Besides, the model also consisted of variables (i.e. the critical factors) that play both roles (i.e. as independent and dependent variables) and a moderator. Third, this study used latent variable score for the HCM analysis. Moreover, in the case of a significant number of data sets (N =

250 and larger), PLS-SEM and CB-SEM produce very similar results (Hair et al., 2017).

Importance-Performance Analysis (IPA) Matrix

IPA matrix was proposed by marketing researchers, Martilla and James (1977, p. 79) to evaluate 'consumer acceptance of a marketing program'. As discussed in Chapter 2, section 2.8, page 113, the IPA matrix is a descriptive-based analysis that offers a valuable result for an organisation's strategic direction. The analysis in IPA matrix is performed through a comparison between the importance and performance scores, with mean or median values as a threshold in evaluating the condition of the examined attributes (e.g. well performing attributes or attributes that require immediate attention). In particular, the use of a median value is recommended by Martilla and James (1977) in the case of big differences between the median and mean values. The result of the IPA matrix is illustrated in four quadrants representing: (i) Quadrant I – *Concentrate here*; (ii) Quadrant II – *Keep up the good work*; (iii) Quadrant III – *Low priority*; (iv) Quadrant IV – *Possible overkill*. The presentation of IPA result according to the four quadrants is popularly applied by researchers in explaining the IPA result of their study.

3.5 SUMMARY

In summary, this chapter has described the overall methodology, methods and approaches applied in this study. The reality in this study is viewed from the stance of a critical realism paradigm. This study applied multiple methods, beginning with a qualitative study before using a quantitative study. The qualitative study was

composed of unstructured preliminary fieldwork and semi-structured interviews. The quantitative study applied a survey questionnaire approach in order to get a broader perception of the investigated phenomenon of the critical factors of AIS effectiveness. The context of this study is the Federal Government of Malaysia with a focus on accounting personnel as the participants. The next chapter now discusses the implementation and findings of the qualitative part of this study.

CHAPTER 4: A QUALITATIVE STUDY – IMPLEMENTATION AND FINDINGS

4.1 INTRODUCTION

This chapter presents evidence from the first part of this study, which is the qualitative study. This comprised of unstructured preliminary fieldwork and semi-structured interviews. The processes involved in implementing the qualitative study and the data analysis are explained accordingly. The findings are discussed and presented in direct quotations (translated) to retain the original meaning of points raised by the participants.

4.2 IMPLEMENTATION OF RESEARCH DESIGN FOR THE QUALITATIVE STUDY

As explained in Chapter 3, section 3.3 Research Design, this study started with the literature review and continued with the qualitative fieldwork. The literature review and the findings from the qualitative fieldwork were revisited during the process of analysis, as well as during the development of the research model and the questionnaire for the next phase of this study. The revisiting processes between the findings and the literature review are performed many times in order to gain a better understanding about the phenomenon of the critical factors of AIS effectiveness in the Malaysian Federal Government context. A summary of the research design implemented in this study is explained in Table 4.1.

Table 4.1: A Summary of the Research Design Implementation for the Qualitative Study

Method/Stage	Implementation
Literature Review Conducted concurrently	Context of Review ▪ Effectiveness measurement ▪ User satisfaction ▪ Accounting Information System (AIS), information system, Management Information System (MIS), Enterprise Resource Planning (ERP) and Activity-Based Costing (ABC) from various context (e.g. implementation, project, adoption) ▪ Accounting and AIS for the Malaysian Federal Government ▪ Theory
Qualitative Study April and May 2015	Data Collection, Phase I: Unstructured Preliminary Fieldwork Group discussions and an observation approach were applied to obtain a deeper understanding of the AIS practice within the Government sector. The findings were used to construct interview questions for the next phase of data collection.
August and September 2015	Data Collection, Phase II: Semi-Structured Interview Exploring the phenomenon of the critical factors of AIS effectiveness based on user perception about the important factors that are needed in order to operate the system effectively. In addition, criteria of an effective system were investigated in order to construct the measurement for the AIS effectiveness. The draft list of the important factors and the AIS effectiveness criteria are refined, and a research model is proposed during this stage. The findings were used to develop a set of questions for the survey.

The various approaches applied in this qualitative part have resulted in several types of data. Apart from the literature review, the unstructured preliminary fieldwork and the semi-structured interviews conducted in this study have offered a closer view of the AIS practice in the Malaysian Federal Government. Multiple

sources of data have added to the richness of the information gathered. Table 4.2 summarises the data gathered during the qualitative part of this study.

Table 4.2: The Summary of Qualitative Data

Stage of Data Collection	Source	Unit of Analysis	Organisation	Detail
Unstructured Preliminary Fieldwork	Type: Text (discussion transcript) Range: Group discussion	Accounting Personnel (Top and Middle management)	AGD	- Four divisions and the top management office - Five meetings (approximately one hour each) - 16 accounting personnel
Unstructured Preliminary Fieldwork	Type: Text (observation note) Range: Observation	Accounting Personnel (Middle management)	AGD	- One accounting division (approximately two hour) - Observing the process in reviewing, salary and payment.
Qualitative Study	Type: Text (interview transcript) Range: Semi-structured interview	Accounting Personnel (Top and Middle management)	Ministries	- 10 ministries - 12 interview sessions (approximately one hour for each session) - 22 accounting personnel*

*Some of the interview sessions are attended by three to five accounting personnel in a session based on their preference.

4.3 PROCESS OF DATA ANALYSIS

The main types of qualitative data source collected from the fieldwork of this study are discussion and interview transcripts. All discussions and interviews were audio recorded. Additionally, observational notes were also taken to enhance the understanding of AIS practice in the context of this study. These notes were directly

referred to while doing the analysis since there was only one observation performed during the unstructured preliminary fieldwork. However, due to the volume of data and lengthiness of conversations, the group discussions and the semi-structured interviews were transcribed in MsWord and analysed in NVivo 11 software. NVivo is commonly used in qualitative data analysis 'to cater for researchers needs to undertake projects ranging from fine, deeply reflective analysis to analytic processing of larger volumes of text sources' (Bazeley, 2007, p. 6).

The data was collected in Malay, English and a combination of the two languages. Therefore, manually transcribing through listening to the audio recordings was preferred. Transcribing tasks were carefully done in the original language of the interview to keep the original meaning of the conversations. Express Scribe Transcription Software[1] was used to assist in transcribing tasks. The software offers useful playback functions, such as slow, fast, rewind and forward, to make it easier to listen to the recorded interviews' conversations. The functions are helpful in doing word-to-word transcribing and minimising mistakes as one can easily control the playback speed, so that the recorded voice can be clearly heard.

Further, a coding analysis of the transcripts was performed in NVivo 11 software. NVivo is a software package that is commonly used in qualitative studies to assist researchers in analysing the content of their data, especially through its coding function. NVivo makes the data easier to analyse as the software helps in summarising the selected content or data into codes according to the researcher's preference.

[1] A professional audio player software that offer a useful playback functions to assist in transcribing the audio recordings. The software is compatible with any technology devices that use Windows or MAC operating systems.

4.3.1 Coding

Previous chapter (i.e. Chapter 3, section 3.4.1 – iii, page 140) discussed the commonly applied coding types in qualitative research. As for the purpose of this study, *initial (open)*, *in vivo* and *simultaneous* coding were applied for the first cycle of coding. *Focused* and *axial* coding were used for the second cycle of coding. The discussion and interview transcripts were first skimmed to get an overview about the participants' opinions prior to coding. Coding was applied to the original transcripts (i.e. in Malay and English) to ensure the original meanings are captured accordingly. After that, the selected quotations were translated into English.

The coding started with *initial (open)* coding in which the opinions that have meaning or related to the context of study were selected. The selected data was examined accordingly based on similarities or differences. The selected opinions were then coded based on an *in vivo* coding approach. In other words, the selected opinions were coded according to keywords from the original words in the transcript. Furthermore, *Simultaneous* coding was also applied when the data contained multiple meanings. For example, if the respondent said an effective AIS is "an easy to use system", that may suggest the criteria of an effective system that is easy to use while simultaneously using sophisticated technology that is able to offer a simple function to its users.

Next, the second cycle of coding started with *focused* coding in which the identified codes were categorised based on themes. The themes are created according to the similarity or nature of the respondents' opinions. After that, *axial* coding was used on the grouped codes and the codes were carefully examined for the connection between them. Table 4.3 and Table 4.4 illustrate some of the coding processes

conducted for the first and second cycle of coding in this study, respectively. As suggested by Saldaña (2013), coding is a cyclical process. Thus, the process conducted in this study is not a one off process. The transcripts were reviewed and coded many times in order to uncover the meaningful codes.

4.4 UNSTRUCTURED PRELIMINARY FIELDWORK

The unstructured preliminary fieldwork was conducted in April and May 2015 with 16 accounting personnel from the Accountant General's Department (AGD) and the accounting office under the Ministry of Finance Malaysia. Both the AGD and the accounting office are located at Putrajaya Federal Territory, Malaysia. The fieldwork was conducted based on meetings and observation at: the AGD's top management; three divisions in the AGD; and the accounting office of the Ministry of Finance Malaysia. The meetings and observation were performed based on the participants' availability and preference. Initially, a face-to-face interview was selected as an approach to conduct the unstructured preliminary fieldwork. However, the respondents preferred to have a group meeting as they believed it would be more convenient to share their knowledge and experience as a group. The purpose of this unstructured preliminary fieldwork was to gain an understanding of the AIS practice within the Malaysian Federal Government prior to the semi-structured interviews. Factors influencing the effectiveness of AIS and the system's users' perception towards an effective system were discussed during the fieldwork. The acquired preliminary understanding of the phenomenon was then used to develop the semi-structured interview questions.

Table 4.3: First Cycle of Coding

Direct Quotation from the Transcript	Translated Quotation	Initial (Open) and In Vivo Coding	Simultaneous Coding
"Kalau boleh [sistem itu] seringkas yang mungkin ataupun semudah difahami. Kalau sistem tak user friendly *susah"*	"The system should be simple and easy to understand. It will be difficult if the system is not user friendly."	- Simple - Easy to understand - User friendly	- Ease of use - Sophisticated system that offers user friendly applications
*"*Reporting *kena macam-macam* report *boleh dikeluarkan. Macam tadi la saya cakap, boleh tak pecahkan hasil tunai berapa? Kad kredit berapa?*	"The system should be able to produce many types of report. As I said just now, can the system separate between the collection of cash and credit card?"	- Able to produce many types of report. - Separate between the collection by cash and by credit card	- Capability to produce many type of report - Complex system that capable to offer the required functions
"Masa dulu I *ingat lagi, dulu kita kena* print *tiga salinan* [payment voucer]. *tapi sekarang satu salinan* instead*."*	"I remember the last time that we had to print three copies [of payment voucher]. But now we only have to print one copy."	- Only have to print one copy	- Paperless - Speed up process - Save time
"Dulu you *buat* claim*, ... sebulan [untuk diproses]. Tapi sekarang, ... kalau* you *boleh hantar hari ni,* you can get your payment tomorrow*."*	"Last time when you submitted a claim, ... it would take you one month [to get processed]. But now, … if you submit your claim by today, you can get your payment by tomorrow."	- If you can submit your claim by today, you can get your payment by tomorrow	- Speed up process - Save time
*"*Make sure *jangan senang nak ubah …* entry *tu kan. Mungkin tak boleh orang senang masuk dan ubah."*	"Make sure people can't easily change … the entered data. The system shouldn't be easily accessed and changed."	- Can't easily change the data - Should not be easily accessed and changed	- Not applicable

Table 4.4: Second Cycle of Coding

Direct Quotation from the Transcript	Translated Quotation	Focused Coding	Axial
"Kalau boleh [sistem itu] seringkas yang mungkin ataupun semudah difahami. Kalau sistem tak user friendly *susah"*	"The system should be simple and easy to understand. It will be difficult if the system is not user friendly."	- Ease of use - User friendly - Sophisticated system that is able to provide simple function to it users	- Quality of the system - Sophisticated technology features
*"*Reporting *kena macam-macam* report *boleh dikeluarkan. Macam tadi la saya cakap, boleh tak pecahkan hasil tunai berapa? Kad kredit berapa?*	"The system should be able to produce many types of report. As I said just now, can the system separate between the collection of cash and credit card?"	- The system is able to produce reports as required - Complex system with compatible functions	- Quality of the system - Sophisticated technology features
"Masa dulu I *ingat lagi, dulu kita kena* print *tiga salinan* [payment voucer]. *tapi sekarang satu salinan* instead*."*	"I remember the last time that we had to print three copies [of payment voucher]. But now we only have to print one copy."	- Save cost - Speed up accounting process - Save time in processing	- Benefit from the system
"Dulu you *buat* claim*, ... sebulan [untuk diproses]. Tapi sekarang, ... kalau* you *boleh hantar hari ni,* you can get your payment tomorrow*."*	"Last time when you submitted a claim, ... it would take you one month [to get processed]. But now, … if you submit your claim by today, you can get your payment by tomorrow."	- Speed up accounting process - Save time in processing	- Benefit from the system
*"*Make sure *jangan senang nak ubah ...* entry *tu kan. Mungkin tak boleh orang senang masuk dan ubah."*	"Make sure people can't easily change … the entered data. The system shouldn't be easily accessed and changed."	- Strong security system	- Sophisticated technology features

The AGD was chosen due to their roles in providing accounting and financial services for the Malaysian government. The AGD is the headquarters for all accounting offices and responsibility centres in the Government. They are responsible for: enhancing the accountability and transparency of reporting for the federal government; improving the effectiveness of decision-making for the Malaysian government; improving the accounting and financial system for government agencies; developing and implementing human resource management system for accounting services; and strengthening the enforcement of the Unclaimed Moneys Act 1995. In addition, the AGD is also responsible for preparing and consolidating the financial reports for the federal government. The audited financial report is presented in the parliament every year. On the other hand, the accounting division (i.e. accounting office) of the Ministry of Finance plays an important role in handling the accounting operation for the ministry. Additionally, a meeting with the Accountant General of Malaysia was held in order to gain an understanding about the system from higher management level's perspective.

A formal request for the unstructured preliminary fieldwork was sent to the AGD through email in April 2015 and follow up by phone calls. In the email sent to the AGD, four divisions under the AGD were targeted. The divisions are;

i. Management of Accounting Office Division (*BPOPP*)
ii. Central Operation and Agency Service Division (*BPOPA*)
iii. Information Technology Development Division (*BPTM*)
iv. Accounting and Management Development Division (*BPPP*)

The consent email from the AGD is attached in the Appendix D. However, in a follow up phone call from the AGD, it is mentioned that the *BPPP* is not available

during the requested date because the head of department and a few other key personnel had courses to be attended. Thus, the *BPPP* was replaced with the accounting division (i.e. accounting office) of the Ministry of Finance Malaysia as suggested by the AGD. See Figure 4.1 for the organisation chart of the Ministry of Finance Malaysia.

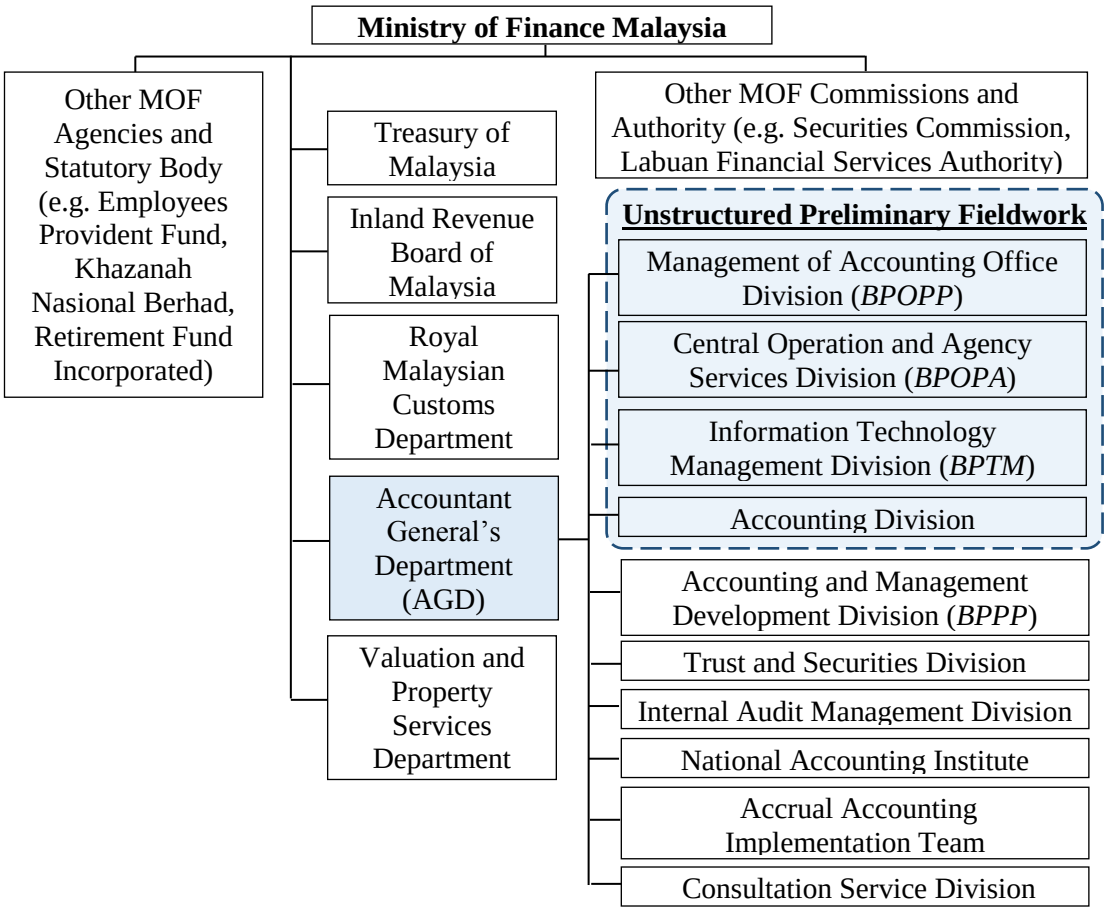


Figure 4.1: Organisation Chart of the Ministry of Finance Malaysia
Source: portal.anm.gov.my

i. Management of Accounting Office Division (*BPOPP*)

Branch Operation and Management division (*BPOPP*) plays significant roles in planning, monitoring and managing the operation of accounting offices in the Malaysian government. This includes standardising the accounting system, analysing

the financial and accounting data collected from the accounting offices, providing the financial advisory services to the accounting offices and ensuring the compliance on standards, policies and procedures. Three key personnel from the divisions agreed to participate. A meeting with them was held and matters related to the AIS operation were discussed accordingly.

ii. Central Operation and Agency Services Division (*BPOPA*)

The Central Operation and Agency Services division (*BPOPA*) is responsible for consolidating and analysing the financial reports of the federal government for submission to the Auditor General of Malaysia. The audited consolidated financial reports will then be presented in the parliament of Malaysia, on a yearly basis. Additionally, the division is also responsible for managing cash and business transactions between the federal and the state government, as well as providing accounting advisory services to the federal government. A meeting was held with four key personnel in the division to discuss the overview and process in the AIS.

iii. Information Technology Management Division (*BPTM*)

The Information Technology Management division (*BPTM*) manages the accounting system of the Malaysian government. The functions of the division focuses on research and development of the system in order to continuously improve the accounting operations by considering the needs of the system's users and ensuring the Government's requirements are met accordingly. Specifically, the division is responsible for conducting relevant training, managing infrastructure, implementing the system and monitoring the system's performance. The division's role to support

the operation of the system is essential to ensure the system works smoothly as required by its users and the Government. One key person agreed to share his opinions and experiences relating to the AIS used by the Government. The person briefly explained the system from a technical perspective.

iv. Accounting Division of the Ministry of Finance Malaysia

The Accounting division of the Ministry of Finance Malaysia operates to provide accounting services to the ministry. The services include recording, managing, monitoring and analysing the accounting data and transactions, as well as preparing the financial reports for internal and external stakeholders. The division is responsible for effectively and efficiently implementing the AIS and complying with the Government's rules and regulations, accounting standards and related acts. In addition, the division plays a role as an advisor to its responsibility centre. Moreover, the division is also responsible for monitoring its staffs and providing relevant training if necessary. Since this division involved daily accounting transactions in managing and reporting the accounting information, a meeting and an observation of the operation were performed during the fieldwork. The meeting was attended by six key personnel in the division. Along with the discussion, the participants briefly explained about the process and cycle of the accounting information from recording to reporting in a formal presentation format. After the meeting, actual processes that are performed in the division were observed by watching the steps taken by the key personnel, for both computerised and manual accounting processes. The observed process includes reviewing, recording, approving and making payments for daily transactions. The observation was accompanied by the interviewees and the steps

involve in the accounting information flows were explained accordingly. Two main accounting functions in the division that were observed are payment and salary. The meeting and observations gave a wider picture of the accounting processes at the Federal Government of Malaysia

v. The Accountant General of Malaysia

The highest position in Malaysian Government accounting is the Accountant General. The Accountant General is responsible for all related Governmental accounting's matters which include planning, monitoring, controlling, analysing, compliance, decision making and reporting at a high level of management. During the meeting, the Accountant General was accompanied by his special officer. Their participation in this unstructured preliminary fieldwork offers some insight into the Government's overall operation.

4.4.1 AIS for the Malaysian Federal Government

The Government's accounting functions are currently assisted by an accounting system namely Government Financial and Management Accounting System (GFMAS). This system is powered by SAP[2] 4.7 software that is customised to suit the Government's operations and needs. The GFMAS is supported by the other related systems, which are *eSPKB* and *eTerimaan* for expenses and revenue collection transactions, respectively. Both, *eSPKB* and *eTerimaan* are developed in-house and integrated with the GFMAS. The installation of the proprietary software (i.e. GFMAS), the development of in-house accounting-related systems and the

[2] SAP is the acronym for System, Application and Products. SAP software is a proprietary software that offers various functions for business such as Enterprise Resource Planning (ERP) system including the accounting and finance.

systems maintenance are assisted by external experts[3] appointed by the Government on a contractual basis.

> "GFMAS is an accounting system used at the accounting office [ministry] level. The system supports accounting functions in reporting, monitoring, controlling and decision-making."

At present, the Government is upgrading its accounting system in order to cater for the transition from cash basis accounting to accrual-based accounting. The upcoming system is called 1 Government Financial and Management Accounting System (1GFMAS). The 1GFMAS uses SAP ECC 6.0[4], integrated with SAP HANA[5]. The integration is expected to create an intelligent system to manage the accounting information, enhance the accounting operation and improve financial reporting for the Malaysian Federal Government. A huge investment amounting to more than 200 million[6] Ringgit Malaysia (approximately GBP37 million) was allocated for the 1GFMAS project. The 1GFMAS will be applied to all accounting operations, replacing both the *eSPKB* and the *eTerimaan*. The 1GFMAS is customised for cash-based and accrual-based accounting. In other words, the system will be able to generate two different accounting-based reports (i.e. cash-based and accrual-based accounting) for the Malaysian Federal Government. However, the implementation of the 1GFMAS, which is supposed to take place in 2015, was postponed as the system was not ready for commissioning by this date. According to

[3] Such as XYBASE Sdn. Bhd., Innovation Associates Sdn. Bhd. and Teliti Computers Sdn. Bhd.
[4] SAP ECC 6.0 is one of the latest versions of SAP. ECC stand for ERP Central Component, which covers the SAP Business Warehouse, SAP Strategic Enterprise Management and Internet Transaction Server.
[5] SAP HANA is a platform for the real time data driven application that built with in-memory database. It allows integration with various data sources.
Source: http://go.sap.com/developer.html
[6] Source: http://myprocurement.treasury.gov.my

one of the key person that is involved in the development of the 1GFMAS and responsible for the implementation of the system, the implementation of the system will be announced once the system is ready for commissioning. The system is expected to be in operation by 2018.

4.4.2 Users and Function of AIS in the Malaysian Federal Government

Basically, an AIS is developed to provide three main technical functions: input; process; and output. Each function has several tasks to be conducted by the system's users in order to manage the accounting process. Therefore, the intention of each user towards the system may vary from one function to another.

The input function commonly relates to data entry. This function is majorly performed by lower levels of management who use the system to do their routine tasks. In the context of the Malaysian Federal Government, the entering of accounting data is typically performed by the responsibility centres throughout the country using the *eSPKB* and the *eTerimaan*. The users of these systems are comprised of accounting and non-accounting staff. The accounting data is recorded through a coding system that is based on the chart of account to specify the nature of the transaction (e.g. expenses, revenue, the responsibility centre and the ministry code).

Furthermore, the process function refers to the task of retrieving, sorting, reviewing, reconciling and transforming the data into information. The function involves major important tasks that need a thorough verification of the accounting data for further action to be taken, such as approving the transactions and making payment to vendors. The function is majorly performed by the system's users at the

accounting office of each ministry in the Malaysian Federal Government through the GFMAS. In addition, some of the system's users at the responsibility centre are also involved in the process function, depending on the nature and size of the responsibility centre. These users are accounting staff that have access to the GFMAS and are authorised to retrieve the accounting data from the *eSPKB* or the *eTerimaan*. Retrieval of accounting data is performed by referring to the code of account. Any error and further clarification needed towards the accounting data are sought at this stage. Thus, the process function requires effective communication between the involved departments (i.e. accounting office and its responsibility centre, as well as other related departments). The process function can be considered as a crucial part in the AIS where major accounting processes are performed at this stage. It requires the capability and credibility of the accountants to process the accounting data into useful information. Technically, this stage is the stage that requires the users to crucially utilise and optimise the system's functions, in order to perform the accounting tasks. Therefore, the users of process functions have a more informed view towards the system performance because they are involved in multiple dimensions of the system such as the quality of data, quality of information, quality of the system and the benefit that they get from the system.

Finally, the output function produces the processed information to be used in decision-making. The users of the output function comprises of internal and external stakeholders. The users do not necessarily need access to enter the specific function in the system. Some of them are only given access to view the information. In most cases, their judgement towards a good system is based on the quality of information that they receive.

4.4.3 Data Analysis for Unstructured Preliminary Fieldwork

i. Preliminary Findings of the Criteria for AIS Effectiveness

Most prior studies measured a system's effectiveness based on a user satisfaction level. This satisfaction can be towards the features and capability of the system, as well as the quality of its output. This is in-line with the preliminary findings from the unstructured preliminary fieldwork as described by some of the interviewees, for example:

> "Stakeholders' satisfaction indicates the effectiveness of the system."
>
> "If the system is able to meet, support and fulfil their [users] concerns, then the system is considered effective."

Naturally, satisfaction comes from fulfilled requirements or expectations. Technically, in the context of an AIS, the users are looking for system features such as user-friendliness, ease of understanding and ease of use. These features may look easy to fulfil by just a simple system in the case of a straightforward organisational structure. But, in the case of the government dealing with a huge volume of transactions and a complex organisational structure, sophisticated technology is needed in order to deliver the required features which, at the same time, are able to manage the complexity of transactions within the government. In addition, the speed of retrieving the accounting information is also one of the effectiveness criteria mentioned by the interviewees.

> "In my opinion, the system is effective when the system is user friendly, produces reliable data and easier to access [as compared to previous ways of accessing the data]."
>
> "The system is considered effective when it can achieve its objective."

> "I can say that the government has a sophisticated system that is quite complex but customised to be friendly to its user."

> "The system is considered effective if the entered transactions can be quickly processed for reporting."

Besides, the system is considered effective based on its ability to produce reliable data with easy access. However, the easy access feature requires a high internal control system to secure the accounting data. Commonly, the use of accounting systems is expected to automate most of the accounting functions (e.g. general ledger, cross-checking etc.). Apart from that, the effectiveness of the system is also considered based on the quality of information generated by the system. Reliable information is important to support the decision-making process. Since high quality of information is crucial for better decision-making, the system's ability to provide such information is reflected in its effectiveness.

> "The system is considered effective when it can help in budget control and allocation. We use the system to retrieve the accounting data and support decision-making."

> "The system is effective when it is able to produce accurate data."

ii. Preliminary Findings of the Factors Influencing the AIS and Its Effectiveness

Factors that are perceived as important or highly desired by the users in order to use the system effectively were discussed and discovered during this stage, in order to get an early understanding about the studied phenomenon. Further discussions about their concerns and opinions towards the current AIS is useful in order to understand the environment surrounding the system.

In the Malaysian government, the chart of account which provides a coding structure of the AIS is applied extensively during the input, process and output function. It is very important for the AIS users to fully understand the coding structure so that the accounting data can be recorded in the right account classification. The code is also used by the other users to retrieve the data and transform it into valuable information. See Appendix E for the example of the chart of account used by the Malaysian Federal Government.

> "The users are depending on the manual chart of account to ensure the classification of accounting transaction is recorded correctly."

Besides, not all of the system users are accounting personnel. The majority of the system users at the responsibility centre are non-accounting staff. Hence, other than seeking advice from the accounting office, having a Standard Operating Procedure (SOP) and other related manual or guidelines is highly necessary to equip system users. It is also seen as one of the tools for accelerating the learning curve for the upcoming upgraded system.

> "In order to ensure everything is fine, the manual/guideline on how to use the system is prepared prior to the system test."

Furthermore, effective communication between system users is also important to support accounting processes throughout the system. Their involvement at an early stage of the decision-making process encourages the appreciation of accounting information and promotes effective utilisation of the information. In other words, instead of just preparing the accounting report for submission purposes, their

involvement in decision-making will encourage them to understand the content of the accounting report, so that they can contribute some ideas and opinions.

> "Sometimes the prepared budget did not reflect the needs of the respective department. However, that is just a minor issue. In most cases, the respective departments and divisions are involved in the preparation of budgets."

As preparation to face the changes in technology and accounting treatment, training is conducted simultaneously to prepare and update the system users' knowledge. At present, only some staffs at the responsibility centres have a qualification of accounting education background. Therefore, a change management strategy is applied on top of training in order to ensure staff are qualified and adequately equipped with the relevant knowledge and capability before the implementation of the upgraded accounting system and transition of the cash basis accounting to accrual-based accounting. In addition, management teams at the accounting offices have proposed to the AGD to allocate at least one member of accounting personnel to each of the selected responsibility centres depending on certain criteria (e.g. responsibility size and volume of transactions). These efforts signal the importance of accounting knowledge in order to operate the system and manage the accounting transactions.

> "We have proposed to the top management that they allocate at least one accounting officer with an accounting background to each of the responsibility centres."

In addition, internal and external experts also play a significant role in supporting the system operations. Internal experts in previous studies are often referred to as internal auditors or the IT department. In the context of this study, the

interviewees viewed the internal expert as a group of people that provide support and advice to solve any technical accounting and technology related issues. In other words, the internal expert refers to the accounting expert and the IT expert. Both experts are available in each ministry as well as at the AGD. For example, the accounting offices at the ministry level always offer their technical and advisory support to their responsibility centre. In practice, any related issues are first referred to internal expertise within the ministry and if needed, the issues will be forwarded to the AGD for further action to be taken.

> "Every ministry has an accounting office that provides advice to their responsibility centre."

> "We have internal expertise to manage any technical issues related to the system."

Moreover, the government is also appointing the external expert as a consultant for the upgrade and maintenance of the system. As a strategy to strengthen the capability of the system's users, the AGD highly encourages a culture of knowledge sharing through the transfer of knowledge between employees. The government's effort to embed a knowledge sharing culture can also be seen from the training structure planned for the upcoming upgraded system. The plan is to train the trainer at the ministry level and the trainer will play their roles in sharing their knowledge with other staff within the accounting office, as well as with their respective responsibility centre.

> "The accounting office plays an important role to spread the knowledge about the system to the responsibility centre. Trainers will be appointed to train the system user at the responsibility centre."

In general, the culture of an organisation may also influence the system's users. Previously, the understanding of information produced by the AIS is primarily the domain of top and middle management. On the other hand, lower management is mainly focused on their routine tasks, such as recording and compiling. However, moving towards the upcoming upgraded system and the accrual accounting that is expected to be implemented in 2018, the culture of knowledge development and encouragement towards staff involvement to share their opinions are used as one of the Government's strategies to strengthen human resource capability.

> "A culture of having the ability to explain the information generated by the system is spread within the organisation. This means all levels of management can share their opinions during the decision-making process."

Apart from relying on human and organisational factors, technological factors are also crucial in AIS effectiveness. Having a sophisticated technology is expected to improve accounting operations. An automation of accounting functions through technology requires a strong internal control system, such as authorisation, auto backup and limit check in order to ensure the data is accurately and securely managed. Additionally, manual monitoring and checking activities (e.g. document inspection) are also performed by the accounting office at their responsibility centre. Both monitoring and control are perceived as important in detecting the weaknesses of the system, as well as compliance of the procedures and regulations.

> "The system has its own internal controls such as authorisation and threshold, so if the amount exceeds the threshold, it will be rejected by the system."

> "Since the accounting operations are mostly performed online, the purpose of inspection is to check the originality of the supporting documents. This is important to ensure the compliance as ticked on the submitted checklist, the assurance of integrity and the accountability of the Government."

4.5 SEMI-STRUCTURED INTERVIEWS

Semi-structured interviews were conducted in August and September 2015 at the accounting offices of several ministries. The interviews aimed for in-depth discussion about the AIS effectiveness and its surroundings (e.g. important factors), based on users' perception and opinion. A formal invitation together with a consent form was sent through email to all chief accountants of the Malaysian Federal Government in June and July 2015. There are 24 ministries and a Prime Minister's Department in the Federal Government of Malaysia. In response to the invitation, 10 ministries agreed to be interviewed. This resulted in 12 interview sessions, of which 22 interviewees from the 10 ministries attended. Precisely, three of the sessions were attended by three to five interviewees per session, as preferred by the interviewees. The other nine interview sessions were conducted on a one-to-one basis. The interviewees comprised of the chief accountants, deputy chief accountants and accountants. The remaining ministries did not participate due to their unavailability, busyness or failure to reply to the email. Follow up calls were made, but some of them could not be contacted through the general line and some were unwilling to participate due to their unavailability during the requested date. Each interview took approximately one hour.

Details about the interview had been clearly written in a formal request letter. In addition, a consent form for the interviewee was attached with the letter. A sample

of the formal request letter for the interview and the consent form replied by the interviewee are attached in Appendix F.

The accounting office was targeted for the interview due to its roles as a user, as well as an intermediate between the responsibility centre and the AGD. Commonly, the basic accounting tasks, such as recording, that are performed by the responsibility centre will go through the accounting office for checking and approval before the data can be forwarded to the AGD for further action.

The agenda of the interview was sent to the respective participants a week before the scheduled interview took place. The agenda summarises the context to be discussed during the interview. It was sent in advance to make the participants aware of the matter to be discussed and to ensure the participants had knowledge about it. According to Gillham (2000), it is wise to provide advance information to the interviewee about the interview (e.g. purpose, duration, date, time and etc.) including basic information about the topic to be discussed for preparation purposes. This is common practice in qualitative research. Table 4.5 presents the agenda of the semi-structured interviews.

Table 4.5: Agenda for Semi-structured Interviews

Agenda	
A.	General Information: Respondent's Background
B.	Overview of Accounting Information System
C.	Accounting Information System Effectiveness
D.	Critical Factor of Accounting Information System Effectiveness
E.	Strategy to Sustain the Effectiveness of Accounting Information System
F.	Others

In particular, the interview questions were outlined in detail to explore the phenomenon of the critical factors of AIS effectiveness. The questions were

developed based on the literature review and early understanding acquired during the unstructured preliminary fieldwork. Therefore, the AIS effectiveness criteria were specifically explored based on the system's users' perception about the system's effectiveness in general. Table 4.6 shows the questions for the semi-structured interviews.

Table 4.6: Semi-structured Interview's Questions

Question
A. General Information: Respondent's Background 1. Please tell me about your education background and working experience relative to accounting and information system. 2. What is your role in your organisation?
B. Overview of Accounting Information System (AIS) 1. How do you define the AIS from the perspective of your organisation? Or what is AIS? 2. What are the objectives of the AIS in your organisation (e.g. budgeting, expenses, planning, decision making and etc.)?
C. Accounting Information System (AIS) Effectiveness 1. How will you define the effectiveness of AIS in your organisation? Or what are the criteria of an effective AIS? 2. What do you expect from the system in order to satisfy your requirements? 3. How important is the effectiveness of the AIS in contributing to your organisation?
D. Critical Factors of Accounting Information System Effectiveness (AIS) 1. What do you need in order to have an effective system? Or what are the important factors in order to operate the AIS effectively? Or what would make the AIS work effectively? 2. Why do you think they are critical/crucial towards the effectiveness of AIS? 3. What causes the system ineffective? Or what lead to the ineffectiveness of the system? 4. What knowledge do you think is essential to operate the AIS effectively?
E. Strategy to Sustain the Effectiveness of Accounting Information System (AIS) 1. In your opinion, what is the best strategy for the AIS to sustain its effectiveness? Or how would you make sure the AIS is effective? Or what is needed to ensure the effectiveness?
F. Others Do you have other opinions to share with regards to the AIS application in Malaysian public sector practices? Or any key area that is not mentioned in the outlined questions, but highly relevant to the effectiveness and improvement of the system?

Each interview started by asking about the interviewee's working experience, education background and role in the organisation. The overview of AIS was discussed in order to determine the interviewee understood the system and its objectives. Furthermore, the AIS effectiveness section required the interviewees to share their opinion about the criteria of an effective AIS. The criteria focused, but were not limited to, user satisfaction. Next, the critical factors of AIS effectiveness were discussed by asking their opinion about the factors that they thought were important, as well as their needs in order to operate the system effectively. In addition, the interviewees were also asked about the factors that led to ineffectiveness of the system. The last agenda discussed the strategy for sustaining the effectiveness of the AIS in order to further determine the critical factors of AIS effectiveness.

4.5.1 Descriptive Statistics from the Semi-structured Interviews

The majority of the interviewees were female and a member of the Malaysian Institute of Accountants (MIA). The lowest education level of the interviewees was a Bachelor's Degree and the highest was a Master's Degree. Some of them had mixed qualifications and educational backgrounds. For example, an interviewee had a bachelor's degree in accounting and a master in another field (e.g. business, human resource, marketing etc.). In total, the interviewees composed of nine chief accountants, four deputy chief accountants and nine accountants. In the context of accounting processes, they were responsible for monitoring and processing the accounting data entered by the responsibility centre for evaluating and reporting purposes. In addition, they were the advisor to their responsibility centre, for any

issues related to accounting and the system. Moreover, they played an intermediary role between the AGD and the responsibility centres whenever necessary. They had access to both the GFMAS and the *eSPKB* or *eTerimaan* (whichever was applicable to their job scope). Table 4.7 shows the descriptive statistics for the background of the interviewees.

Table 4.7: Descriptive Statistics of the Interviewees' Background

Description		**Percentage (%)**
Gender	Male	27
	Female	73
Education Level	Bachelor's Degree	68
	Master's Degree	32
Professional Body	Yes – Malaysian Institute of Accountant	86
	No	14
Position	Chief Accountant	41
	Deputy Chief Accountant	18
	Accountant	41

4.5.2 Data Analysis for the Semi-structured Interviews

i. Specific Criteria for the Measurement of AIS Effectiveness

Prior studies used various ways to measure system effectiveness (e.g. cost-benefit analysis, impact on performance, system usage and user satisfaction). The effectiveness criteria explored in this study is based on user requirements towards the AIS. According to Salehi et al. (2010), an effective system is a system that is able to meet its users' requirements. Hence, the interviewees' requirements and expectations towards the criteria of an effective AIS were discussed during the interview session.

Some of the interviewees said a good system that satisfies their requirements would be an easy to use system. Ease of use in this context means features of the system such as user friendliness, simple command and each application provided in

the system being easily understood. A complicated system may discourage learning and exploration of the system. This may causes limited usage of the applications and functions that are available in the system.

> "The system should be simple and easy to understand. It will be difficult if the system is not user friendly."
>
> "We have to bear in mind that the system is not only used by the accounting personnel. The system is also used by an Administration and Diplomatic Officer [*PTD*], engineer, lawyer, doctor and so on. Thus, it is important that the system is user friendly. In other words, the system is easy to understand … and uses layman language for accounting that everybody can understand."
>
> "The system should be user friendly. So, it is not difficult to understand each component in the system."

Apart from that, the interviewees also emphasised the criteria of the required quality. The quality discussed during the interviews covered the system criteria and its output (i.e. information). In the context of information quality, most of the interviewees expected high quality data and information from the system. The common features of information quality are accuracy, completeness, timeliness, relevance and summarisation (Hall, 2010). They also wanted the system to be able to produce various types of reports and provide a summary of information that met the requirements of different levels of management. For example, the system should be able to segregate two expenses report, which are expenses paid by cheque and expenses paid by Electronic Fund Transfer (EFT)[7]. Information requirements may vary according to the level of management. While operation or lower level management and middle management may need detailed information, top management commonly asked for a summary of the information (Hall, 2010). The

[7] 'EFT is a generic term describing the transfer of funds between accounts by electronic means rather than conventional paper-based payment methods' (Boczko, 2012, p. 82).

variation of reports that meet users' requirements will add value to the information produced, which subsequently contributes to improving the decision-making process.

> "The system should be able to produce many types of report. As I said just now, can the system separate between the collection of cash and credit card?"
>
> "The information given must firstly be, complete. Second, accurate."
>
> "Good information is accurate information, that has an integrity and genuinely. So, we have no doubt on the information. That is the right one."

In order to maintain a high quality of data and produce high quality information, the system itself must equally be of high quality. The quality of the system in this study is viewed in terms of the system's performance, such as speed, real time updates, automation of certain accounting tasks (i.e. calculations) and user friendliness. Sori (2009) reported that the automatic functions of the system such as, auto check balance, auto matching of details and so on, can minimise human error.

> "Currently, we have a very good system in place. As you know that our account, we can close the account on time."
>
> "The system should able to provide the current balance. Let's say the information is requested at nine o'clock, the system should able to show the information as at nine o'clock."
>
> "In my view, if the system is good, it would able to auto entry to the relevant journal when we key in the data. Meaning that, we only have to put one entry."
>
> "As for the system's performance, is it slow? Is it quick enough?"
>
> "In designing the system .. we want to make sure the system can minimise all errors. To minimised all errors. That is the system I expect there to be."

Besides that, applying a technology to the accounting process definitely simplifies it, especially when it comes to a submission of reports or documents. An online submission makes the process easier and reduces the consumption of paper. Moreover, the online transaction can speed up the accounting process. Sori (2009), through a case study analysis, found that the automation function on some accounting tasks has expedited the process of producing financial statements. In addition, the AIS is developed with an integration function between systems in the Government to provide a better platform in sharing information within the management. Along with that, other benefits from the integration such as broader access to the relevant information (e.g. non-financial information to support the financial data) added value to the organisation's operations, management and the decision-making process. Furthermore, the AIS may encourage the staff to enhance their performance as things can be done faster than before.

> "We are able to retrieve whatever information [from the system] that is requested by the top management."

> "To smoothen the process, we commonly use a computer application."

> "I remember the last time that we had to print three copies [of payment voucher]. But now we only have to print one copy."

> "Last time when you submitted a claim, ... it would take you one month [to get processed]. But now, … if you submit your claim by today, you can get your payment by tomorrow."

> "Through GFMAS, the Government has introduced Electronic Fund Transfer [EFT] payment, which will benefit the stakeholders as well. Before this, we need to issue a cheque, but now it is directly transferred to their account."

There are many ways to satisfy the system's users. Their requirements towards the system also vary from one person to another, depending on their level and usage of the system. However, this study intends to come up with general criteria to surrogate for the measurement of AIS effectiveness by considering the users' requirements and wants.

ii. The Phenomenon of AIS Effectiveness

On top of the list drafted from the literature review and factors discovered during the unstructured preliminary fieldwork, some other additional factors were discovered during the semi-structured interview sessions. Some of the factors discussed during the interviews are well-known from prior literature such as management support, commitment, communication, culture, qualification, internal and external expert, performance review, training and infrastructure. These factors are reported in prior studies to have a significant relationship with the system either from the context of adoption, implementation, data quality or effectiveness. However, the interview discussions provide a better picture of the current system in use.

> "Non-accounting personnel do not understand the flow of the accounting data. They do not know. They just key in. But, that does not restrain them to complete their work because the work will then be checked by their supervisor."

The Critical Factors of AIS Effectiveness

Furthermore, the interview discussions have brought this study into a more practical view of the factors that influence the AIS effectiveness and the antecedents for the discussed factors. As discussed, there are two main factors that have been

highlighted by the interviewees to have a direct effect on the system operations: humans; and technology. Logically, a good employee using poor technology will cause difficulties for the operations and lead to system ineffectiveness, or vice versa.

> "Overall, in my opinion, .. the system involves people, machines and of course, information."
>
> "AIS is everything from technology to engineering to human factor."
>
> "I think an ineffective system can be caused by two errors. First, system error. Second, human error."

The importance of human capability towards the system has been emphasised many times by the interviewees. Besides the technology, humans as a system user need to perform well in order to achieve system effectiveness.

> "Overall, we run the system that is developed by the Accountant General Department. We act as an agent."
>
> "Mostly it is human. Human is the main factor that critical for the system."
>
> "The factor .. that make the effectiveness of the system is the people."
>
> "Even if you have a sophisticated system, it starts with humans."
>
> "We need people to support."
>
> "We have the wish list, we have a good system. But, we also have humans."

Specifically, the system requires its users to be committed to using it effectively. The concern of user commitment during the interviews can be seen from the discussion about their effectiveness, passion, support and ethics towards system use.

> "If the head of department left, but the remaining staff are effective, then there is no problem."
>
> "The system needs a passionate user."
>
> "If the system is good but if we are not committed towards it, we just simply don't care."
>
> "Let's say you have a good system, but you don't know how to use it or you misuse it. When you misuse the system, it becomes ineffective."
>
> "People that use the system sometimes download too many things on their computer, meaning the computer can be easily attacked by viruses. So when there is a problem, .. sometimes it's not the system that can't be accessed, but the computer. Too many things have been installed on it."

On the other hand, the technology capability is perceived as an important factor in operating the system in today's world. Reliance on technology in the accounting process cannot be denied. The increase in economic transactions and the highly competitive environment have forced almost all organisations in the world to adopt technology facilities for their operations.

> "Now it is PC [Personal Computer] based. Previously was on a mainframe. So, I think to be successful on any system, for example AIS, .. we need infrastructure."
>
> "High volume of transactions requires us to use computerised accounting."

Antecedents for the Critical Factors of AIS Effectiveness

Interestingly, the interviews discovered that the internal expert is needed in order to maintain or improve the technology. It indicates the internal expert as antecedent for technology capability instead of system effectiveness.

> "We have an internal expert for the technology. They look after the server. Up and down. In terms of accounting matters, we refer to AG [Accountant General Department]."

Similarly, a supportive environment culture is also viewed as a way of encouraging system usage. An open door policy is being practised within the Malaysian Federal Government organisations in order to encourage the system's users to improve their performance. Besides, this culture provides comfort for the system's users as it encourages them to seek for advice when needed.

> "Always be with them. These people, .. I always open the door for them. I told them please come forward."

Some other factors have also been extensively reviewed by previous researchers such as monitoring activity, internal controls, knowledge transfer and the relationship between the system's users. Most importantly, knowledge is crucial to enable the AIS users to operate the system. Without knowledge, it may be difficult for the system's users to use the system.

> "The people that want to use the system must have the required knowledge."

Furthermore, a manual guideline on how to use the system and a file manager that clearly describes the procedure and the job scope are important to the AIS users, in order to operate the system and do their job. However, just having the manual guideline and the file manager would not be sufficient if the system's users did not comply with it. It is common in today's practice that any implemented system comes with its SOP and manual guideline. However, some of the instructions might not be properly followed by some of the system's users. Breaking the rules in terms of non-

compliance with procedures and breach the authorisation to access the system are some of the reasons that lead to the ineffectiveness of the AIS.

> "You have to do this, you have to call this screen and that is how we work. And that is why, even if you are new to the job, we must have the manual. When you have the manual to go through, you know what to do. Then we have the file manager that tells how to do it."

> "As I said, the manual is important because it tells us all the useful functions in the system. If not, we will only get some of the benefits from it from such an expensive system."

> "The system has its own internal control, in which only an authorised personnel can gain access to certain levels. However, non-compliance with the authorisation by giving the access to unauthorised personnel, probably when the personnel is off duty, makes the system ineffective."

Another issue highlighted by the interviewees during the fieldwork is the allocation of staff. Some of the interviewees mentioned that the government should allocate its staff according to their educational qualifications. The government should hire the right personnel for the right position in order to ensure that the system is operated by qualified personnel. The discussion on this matter concerned the academic qualifications, knowledge and competency of the assigned personnel.

> "Please make sure the right people are in the right place. Right people in this context are referring to accounting personnel. So that they understand the debit and credit … and will be able to advise their boss."

Moreover, some of the AIS users do not have an accounting academic qualification background, including the top management at the ministry level. In the Malaysian Federal Government, the highest position in every ministry is held by the Chief Secretary (equivalent to Chief Executive Officer in the private sector). The

Chief Secretary may have one of many qualifications or come from a distinct educational background. Those with limited accounting knowledge may not be interested in the report produced by the AIS. It is a common situation where people are not interested in the accounting report unless there are specific issues they would like to look at. Some of the interviewees mentioned that the system would be useful if the information produced by the system were utilised at all levels. Therefore, appreciation of the accounting information should be practised at all levels. Top management should be equipped with the ability to understand the basics of accounting reports, such as the monthly management report and the financial statements. On the other hand, lower management should be encouraged to get involved at an early stage of the decision-making process. This can encourage the system's usage and promote the appreciation of information produced by the system.

> "AIS should able to educate the top management in making a decision. Then we can see the benefit of the system."

> "No matter how sophisticated the system is, there is no point if the produced information is not fully utilised."

On the other hand, the accounting processes are not just influenced by system users at the accounting office, but also by the other related operations that are incorporated within it. For example, the process of staff claims started from the responsibility centre before going to the finance department and then to the accounting office. Technically, the process and structure of the system is designed in a way that involves multiple processes performed by several personnel in order to complete the whole task. Specifically in the context of technology, integration between the systems in the Government is one of the important factors that enable

the system's effective operation. For example, the accounting data entered at the responsibility centres will then be retrieved by the accounting office or the headquarters. Therefore, integration between systems, the relationship between the involved departments in terms of the system's users' commitment and effective communication between the system's users are necessary to smooth the accounting processes. Prior studies have discussed the importance of the relationship between system's users, from the perspective of the ERP implementation and adoption, that is focusing on a good relationship between the project team member and the system's users (Shaul and Tauber, 2013), and teamwork or collaboration (Aziz et al., 2012; Ngai et al., 2008). In particular, this study views the relationship between the system's users in the context of an on-going operation of the AIS. The users may come from various departments that are connected through the system.

> "The system used to collect the Government's revenue should able to integrate with the system at the Accountant General's Department."

> "If there are delays, you have to see it from other angles as well because some of the processes started from the finance department."

Besides, a good relationship should not just be focused within the organisation, but also with external parties, such as consultants. Consultants are important in order to get advice or solve any matters that arise with regard to the system that cannot be solved by the internal expert. However, support from external experts is commonly obtained by the headquarters (i.e. the AGD). Practically, the responsibility centre is assisted by its particular accounting office at the ministry. However, the problem that cannot be solved by the accounting office will then be forwarded to the headquarters and the headquarters will seek an external expert's

advice if necessary. Hence, due to the uniqueness of the Government's nature and operations, it is also important that the appointed consultant understands the Government environment and needs.

> "Support from the consultant … is very important. Let say we have a problem, so we need them to come up with a solution on the same day."

> "Consultants must understand our needs."

Furthermore, advancement in technology and improvement in internal controls allows the minimisation of unnecessary delays and redundant tasks. Internal control is designed to demonstrate the quality of data and information. Lack of internal control may create doubt among the users of information and vice versa. In particular, data quality checking is found to be among the important activities in ensuring the integrity of the data (Sacer and Oluic, 2013). In the context of the Malaysian Federal Government, the practice of inspection of the documents and procedures is performed at least once a year by the accounting office at its entire responsibility centre throughout the country. While the accounting office is responsible for reviewing the entered data by its responsibility centre, the responsibility centre is responsible for keeping the supporting documents and providing them when requested. The quality of data, which is one of the criteria of AIS effectiveness, starts from the input process. Thus, the purposes of the inspection are to ensure the genuineness of the data, the existence of supporting documents, the completeness of data in the system and the compliance with the relevant procedures.

> "Make sure people can't easily change … the entered data. The system shouldn't be easily accessed and changed."

> "We try to eliminate unnecessary delays. But at the same time we try to maintain a high integrity on our checking."

On the other hand, the technical performance of the system is not consistent at all times. It can be affected by other related factors in its surrounding environment, such as the rapid changes in technology and increased transaction volume. Thus, a technical review on system performance is also important to ensure the technology remains capable. This can be in terms of an Information Technology (IT) audit or an Electronic Data Processing (EDP) audit, in order to ensure the system is operating as required. The review should be performed not only on the system, but also on the SOP and its manual guidelines. This is important in order to ensure that any changes made on the system have been updated accordingly for the system's users' reference.

> "We have to check the manual. Revisit the guidelines."

> "We must review the system from time to time. Either system audit or system maintenance… Schedule for review session must be set."

> "The system has to be audited … so if there is something wrong with the system, it can be highlighted for further action or improvement."

Moreover, benchmarking with other developing and developed countries can also help to check the status of the current system in use. Especially in the case of the Malaysian government, it is difficult to assess the system's performance because the Government has no competitor within the country. Hence, comparison or benchmarking with other successful countries will be helpful in ensuring that the system is up-to-date and not obsolete.

> "We might say that we have a good system. But other countries might say that they had this system 10 years ago."

4.6 QUALITATIVE FINDINGS ON THE CRITERIA FOR AIS EFFECTIVENESS

Previous studies discussed various criteria or characteristics of an effective AIS. System effectiveness is commonly measured using proxies for the criteria that represent the goodness of the system based on various aspects, such as quality, output, cost, benefit and performance. As system effectiveness relates to the system's success and acceptance in the first place, most of the prior studies partly applied the dimensions of DeLone and McLean Information System Success Model (hereinafter referred as D&M IS Success Model), Technology of Acceptance Model (TAM) and End-User Computing Satisfaction (EUCS) to proxy the measurement of system effectiveness. The adoption of several dimensions in the models (i.e. D&M IS Success Model, TAM and EUCS), instead of adopting all dimensions, was made by the researchers in order to suit the context of their study.

As such, the development of the list of criteria for an effective AIS in this study is drawn from the D&M IS Success Model, the modified and extended D&M IS Success Model by other researchers, TAM, EUCS and other criteria discussed in the literature review. In addition, the findings from the qualitative data of this study were applied accordingly. Based on the qualitative findings, most of the interviewees mentioned that the AIS is perceived as effective when it is able to meet its users' requirements, as well as to satisfy them. Thus, is it suggested that the effectiveness of AIS in this study be measured from the perspective of user satisfaction towards the specific criteria of system effectiveness. In other words, a high satisfaction level indicates a highly effective system. Most of the criteria found during the fieldwork have been discussed by prior researchers. However, this study revealed some of the

criteria in a more specific context of the Malaysian Federal Government, with additional proposed criteria. Table 4.8 illustrates the criteria of AIS effectiveness from the previous studies as well as from the qualitative fieldwork of this study. The proposed list of AIS effectiveness criteria in this section are presented in a raw basis in which some of the criteria is actually sub-criteria for other items.

Table 4.8: The List of AIS Effectiveness Criteria

Criteria	Source
1. Ease of use	Cohen et al. (2016); Ilias and Zainudin (2013); Ifinedo (2006); Ifinedo and Nahar (2006); Davis (1985).
2. Benefit/Usefulness	Bach et al. (2011); Garcia-Smith (2007); Seddon (1997); Davis (1985).
3. Satisfaction (i.e. either overall or in a specific context)	Chalu (2012); Kouser et al. (2011); Ilias and Razak (2011); Al-Maskari and Sanderson (2010); Ilias et al. (2009); Ismail (2009); Mohamed et al. (2009); Garcia-Smith (2007); Ilias et al. (2007); de Guinea et al. (2005); DeLone and McLean (2003); Gable et al. (2003); Rai et al. (2002); Chin and Lee (2000); Myers et al. (1997); Seddon (1997); Kettinger and Lee (1994); Thong and Yap (1996); Thong et al. (1994); Pitt et al. (1995); Gatian (1994); DeLone and McClean (1992); Torkzadeh and Doll (1991).
4. Information quality (e.g. accurate, complete, reliable, relevance, timely and etc.)	Cohen et al. (2016); Fitriati and Mulyani (2015); Rapina (2014); Chalu (2012); Komala (2012); Rahayu (2012); Dehghanzade et al. (2011); Ismail (2009); Ifinedo (2006); Ifinedo and Nahar (2006); DeLone and McLean (2003); Gable et al. (2003); Myers et al. (1997); Pitt et al. (1995); DeLone and McLean (1992).
5. Quality of the system	Cohen et al. (2016); Chalu (2012); Ismail (2009); Ifinedo (2006); Ifinedo and Nahar (2006); DeLone and McLean (2003); Gable et al. (2003); Myers et al. (1997); Pitt et al. (1995); DeLone and McLean (1992).
6. Impact	Ismail (2009); Ifinedo (2006); Ifinedo and Nahar (2006); Gable et al. (2003); Myers et al. (1997); Thong et al. (1994).

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Criteria	Source
7. Smooth procedure and operation	Rahayu (2012).
8. Enhance productivity	Myers et al. (1997).
9. Reduce cost (e.g. paperless)	Myers et al. (1997).
10. Support decision making	Kharuddin et al. (2010).
11. Perform accounting function	Belfo and Trigo (2013); Pierre et al. (2013); Salehi et al. (2010).
12. Improve accounting operation and report	Ilias and Zainudin (2013); Sacer and Oluic, 2013).
13. Manage business activities	Dalci and Tanis (2009).
14. The system is able to produce various types of report that required by its users	Qualitative findings from this study
15. Minimise unintentional error	Qualitative findings from this study
16. Systematic accounting operation	Qualitative findings from this study
17. Speed up the accounting process	Qualitative findings from this study

According to the literature review and the findings from the qualitative fieldwork, the criteria of AIS effectiveness in this study are divided into three categories as follows:

i. System quality

ii. Information quality

iii. Benefits/usefulness of the system

The new criteria discovered during the fieldwork, which are systematic accounting operations and speeding up the accounting processes, are combined into one criterion (i.e. improve individual productivity). Further refinement of the criteria is made according to the qualitative findings as elaborated in the data analysis for the unstructured preliminary fieldwork and the semi-structured interviews, section 4.4.3 and section 4.5.2, respectively. Hence, the preliminary proposed measurement of AIS effectiveness that is suggested to be measured by user satisfaction level is shown in Table 4.9. The proposed measurement reflects the expectation of the AIS users for

a stable and an on-going system that is currently used by the Malaysian Federal Government.

Table 4.9: The Preliminary Proposed Criteria of AIS Effectiveness

Dimension	Measure (Criteria)
System Quality	- User friendly - Easy to understand - Easy to use - System processing time (speed) - System capability to produce reports in a required format
Information Quality	- No doubt - Accurate - Completeness (all transaction are captured accordingly) - Relevant for use in decision-making
Benefit/Usefulness of the System	- Improve individual productivity - Improve decision-making process - Minimise unintentional error - Reduce hard copy submissions (paperless)

4.7 QUALITATIVE FINDINGS ON THE CRITICAL FACTORS OF AIS EFFECTIVENESS AND ITS ANTECEDENTS

Starting with a draft list of factors influencing the AIS effectiveness drawn from the literature review, the draft is added and modified according to the qualitative findings of this study to practically reflect the needs of the AIS users. Although prior studies found and reviewed a long list of factors influencing the effectiveness of AIS, this study narrows it to specific factors relevant to today's practice for a stable and on-going system. Some of the factors from the literature review are matched to the preliminary qualitative findings of this study, such as commitment, top management support, allocation of human resources, internal and external expertise, training and so on. Additionally, additional factors were discovered. The additional factors may

have been discussed in prior studies in the context of project adoption and implementation. But this study specifically discusses the factors in terms of a stable and on-going system. The critical factors of AIS effectiveness from the literature and the newly discovered factors or sub-factors are listed in Table 4.10 together with the sources of the factors or sub-factors.

Table 4.10: The Preliminary Proposed Critical Factors of AIS Effectiveness

Factor	Source
1. Commitment	Fitriati and Mulyani (2015), Indahwati (2015), Iskandar (2015), Rapina (2014), Syaifullah (2014), Saleh (2013), Zhang et al. (2013), Rahayu (2012).
2. Relationship, teamwork and cooperation	Saleh (2013), Imtiaz et al. (2013), Aziz et al. (2012), Ifinedo and Nahar (2006), Ngai et al. (2008), Myers et al. (1997).
3. Effective communication	Imtiaz et al. (2013), Wiechetek (2012), Ngai et al. (2008), Nah and Delgado (2006).
4. Knowledge	Agung (2015), Nabizadeh and Omrani (2014), Tamoradi (2014), Daoud and Triki (2013), Tóth (2013), Chalu (2012), Komala (2012), Wiechetek (2012), Hajiha and Azizi (2011), Kouser et al. (2011), Ismail (2009), Ismail and Abidin (2009), Mgaya and Kitindi (2008), Sajady et al. (2008), Ismail and King (2007).
5. Competency	Iskandar (2015), Daoud and Triki (2013), Zhang et al. (2013), Aziz et al. (2012).
6. Qualification of personnel	Taber et al, 2014), Imtiaz et al. (2013), Chalu (2012).
7. User's involvement in system development	Imtiaz et al. (2013), Ismail (2009), Aziz et al. (2012), Choe (1996).
8. Top management support	Imtiaz et al. (2013), Zhang et al. (2013), Aziz et al. (2012), Ngai et al. (2008), Nah and Delgado (2006).
9. Training	Medina et al. (2013), Tijani and Mohammed (2013), Chalu (2012), Wiechetek (2012), Ifinedo and Nahar (2006), Choe (1996).
10. Internal expertise	Zhang et al. (2013), Chalu (2012), Pitt et al. (1995).
11. External expertise	Zhang et al. (2013), Chalu (2012), Kouser et al. (2011), Ismail (2009), Ngai et al. (2008), Thong et al. (1996).

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Factor	Source
12. Strategy	Imtiaz et al. (2013), Wiechetek (2012), Tuzcu and Esatoglu (2011), Doom et al. (2010), Ngai et al. (2008), Nah and Delgado (2006).
13. Procedures and regulations	Saeidi et al. (2014), Wiechetek (2012).
14. Proposition/allocation of team member	Imtiaz et al. (2013), Choe (1996).
15. Monitoring and review	Sacer and Oluic (2013), Chalu (2012), Zhang et al. (2013), Ngai et al. (2008).
16. Culture (knowledge sharing and development)	Fitriati and Mulyani (2015), Aziz et al. (2012), Wiechetek (2012).
17. Supported infrastructure	Indahwati (2015), Taber et al. (2014), Ramazani and Allahyari (2013), Wiechetek (2012).
18. Sophisticated technology	Ramazani and Allahyari (2013), Sacer and Oluic (2013), Alzoubi (2011), Kouser et al. (2011), Ismail (2009).
19. Compatibility and flexibility of system/technology	Ramazani et al. (2014), Wiechetek (2012), Byrd and Turner (2000).
20. System security and internal control	Saeidi et al. (2014), Ramazani and Allahyari (2013), Sacer and Oluic (2013).
21. Benchmarking	Shaul and Tauber (2013), Ngai et al. (2008).
22. Chart of account	Qualitative findings of this study
23. Fila manager and accounting standards	Qualitative findings of this study
24. Compliance with Standard Operating Procedures (SOP) and related regulations.	Qualitative findings of this study
25. Effective use of AIS	Qualitative findings of this study
26. System review	Qualitative findings of this study
27. Appreciation of accounting information	Qualitative findings of this study
28. Inspection of documents and procedures	Qualitative findings of this study
29. Relationship within AIS users as well as between departments	Qualitative findings of this study

According to the qualitative findings of this study, not all of the stated factors shown in Table 4.10 critically influence system effectiveness at all stages of its evolution. As the assessed system effectiveness in this study is referring to the current system in use (i.e. a stable system), some of the factors are identified as

antecedents for the critical factors of AIS effectiveness. Generally, most of the previous studies discussed the factors influencing the system from the perspective of system adoption, implementation and acceptance. This study focused on a stable and on-going system that is currently being used by the organisations (i.e. the ministries) in the Malaysian Government. Different stages of the system evolution may have different factors influencing its performance (Choe, 1996), as well as success (Cinquini and Mitchell, 2005). Therefore, the various factors influencing the AIS found in prior studies might not affect the AIS effectiveness in terms of an on-going system, but probably affect the critical factors of the system's effectiveness (i.e. as antecedents). Based on the qualitative findings of this study, the operation of the system mainly depends on its users and the installed technology. Both have to perform well in order to make the system effective. Besides, the contribution of the system's users and technology towards AIS effectiveness can be affected by the design of the process (i.e. steps needed to complete the accounting process), as well as the organisation's structure.

Overall, the findings on the critical factors of AIS effectiveness in this study reveal the main components of the system. As such, these components are referred to in this study as an anchor to explain the phenomenon of the critical factors of AIS effectiveness. The components are viewed as the main drivers to operate the system, in which missing one of them might impair the system's performance or, in the worst case, cause malfunction of the system. Adopting the main components listed by Picolli (2012), this study discusses four main components of an information system: people; technology; process; and structure.

4.7.1 User Commitment as a Critical Factor of AIS Effectiveness

The qualitative findings of this study reported the importance of people's support for the AIS operations. People in the context of AIS, who are the AIS users, are seen as having a direct influence on system effectiveness. The system's user in this study is defined as a person that uses the system in performing their work. As a person that is directly in touch with the system, his or her attention and attitude towards operating and using the system will affect the system's effectiveness. This reveals the importance of the system users (i.e. people) from the perspective of their commitment.

User commitment is demonstrated by their involvement as well as the way they use the system. In-line with that, the importance of system usage in information systems has been considered in various models by previous researchers (e.g. DeLone and McLean, 2003; Myers et al., 1997). Furthermore, the system's users' involvement in the accounting processes, including discussion and decision-making, reflect their commitment. Referring to the qualitative findings, a committed user, most of the time, is concerned about the performance of their work, as well as the performance of the system. Thus, they will always find a best way to perform their tasks and subsequently optimise the performance of the system. Moreover, a committed user tends to follow the outlined rules and ethically use the system when compared to uncommitted users.

Therefore, user commitment towards the system is highly important in order to achieve system effectiveness. **User commitment in this study is suggested as a critical factor of AIS effectiveness**. The commitment of the user is viewed based on ethical use of the system through compliance on rules and regulations, prioritisation

of the system's usage and involvement in decision-making activities. This includes compliance with the chart of accounts, the file manager and the accounting standards that were presented earlier in Table 4.10, section 4.7, page 203.

4.7.2 The Technology Support Function as a Critical Factor of AIS Effectiveness

Technology is one of the components of information systems. It has been widely acknowledged that an organisation's operations are partially reliant on technology to support the organisation's economic activities, on top of human capital. Based on the qualitative findings of this study, the technology support function is viewed as one of the critical factors to achieve AIS effectiveness.

Practically, technology is needed to support the accounting operations in order to cope with the increase in transaction volume, size of the organisation and the competitive environment surrounding the organisation. In a large organisation, such as the government, it is almost impossible to manage accounting processes manually. The capability of technology in providing security and back up for the entered and processed data allows for more effective and efficient ways in managing and handling the data. Security and control facilitated by technology functions are important and considered as a value added to the internal control structure of an organisation. Moreover, in most of the large organisations, these functions are beyond a value added to their internal control, but, crucially needed as part of their internal control. Good technology is perceived by the interviewees as technology that is able to securely manage the entered data, up-to-date in a way that at least meets the

organisation's requirements and can be integrated with other systems in the Government.

Furthermore, due to the huge volume of transactions that occur every day, almost all of the recurring accounting transactions (e.g. monthly expenses) are kept in a digital format, except for some transactions (e.g. trust fund) which require a manual hard copy record in addition to the system. The report is commonly printed on a weekly or monthly basis to be kept for a certain period of time. Any dispute of the data will be reconciled by reviewing the hard copy, the soft copy and the supporting documents. Therefore, management is still needed to keep the hard copy report for future reference as well as for submission purposes (e.g. management report, budget preparation etc.). Nevertheless, the application of technology in the accounting process has reduced the need for hard copy submissions.

Regardless of the advantages of technology, its usage also creates the risk of system failure and server downtime. In addition, technology can also be manipulated and misused by its users. Thus, strong data protection is needed, as well as a data back-up function, in order to secure the stored data. Hence, up-to-date technology is required. The technology does not need to be the latest version, however, timely updates and compatibility with the organisation's needs should be ensured. It is important that the technology is capable of supporting the accounting operations as required.

Moreover, the Government is managing the whole country, in which its organisations are located throughout the country (e.g. headquarters and responsibility centres). These organisations are also equipped with several other related systems that were developed for a specific purpose (e.g. Human Resources Management

Information System, budgeting system, electronic collection system etc.). Hence, integration features between these systems and the AIS is helpful in updating the data while ensuring its quality (e.g. completeness and accuracy), as well as minimising human error.

Generally, an acknowledgement towards the importance of technology to support the Government's accounting activities can be seen through the Government's efforts to improve their IT, the modernisation of technology related infrastructures and the upgrade of the AIS. In doing so, the Government has appointed an external and internal expert, as well as review its current technology. The importance of these practices should not only evident during the adoption stage of a new system, but also for the maintenance of the current system.

However, in terms of the external expert appointment, such as a consultant or vendor, it is common for them to work on a contractual basis for designing, developing, upgrading and implementing the adopted system (early implementation stage). Throughout the contract period, a transfer of knowledge from the external expert to the internal expert is practised accordingly. This practice enables the capability of the internal expert to independently handle any issues related to the system. Nevertheless, due to constraints on the contract period, some of the knowledge might not be transferred properly. Besides, some knowledge is experience based, which cannot be easily transferred to others. Therefore, the external expert will still be contacted by the internal expert, even after the contract period, if there are any issues that cannot be solved by them. In practice, it is the responsibility of the internal expert to ensure the system is operated as required. The AGD as a headquarter office holds a big responsibility for the status and operation of

the AIS. The task of ensuring the system's status and operation is assisted by the accounting offices of all ministries through monitoring and review activities.

Overall, the technology support function plays a crucial role towards the operation and performance of the AIS. Well-functioning technology is perceived in terms of the technology's capabilities (i.e. strong data protection and back-up and integration function between systems in the Government) and conditions (i.e. up-to-date hardware and software). Leakage in the system's security, incompatibility between systems and outdated technology might disable the management's capability to face the challenges to come, either from the side of technology or accounting practice. Moreover, improvement of the accounting standards and practices had called for advancement in technology in order to cope with the changes. Thus, the **technology support function is viewed as a critical factor in achieving the AIS effectiveness.**

4.7.3 Antecedents for User Commitment

i. Knowledge

The task or job scope in the Malaysian government organisations is standardised and well-structured. That means the AIS users are allocated a specific task that commonly becomes their daily routine task, especially the middle and lower management levels. Specifically, they are provided with SOP, a file manager (i.e. job scope details) and specific regulations. In addition, they are guided by their superior officer. Practically, they have to understand the function and processes of the system; or at least those related to their task. Having an academic qualification background in accounting is an advantage for the system users. Besides that, having experience in

accounting and AIS as well as a good knowledge of accounting standards are considered as an added value to them. However, some of the AIS users do not have an accounting background and have no experience with accounting or the system. Therefore, a knowledge improvement strategy (e.g. training, transfer of knowledge) is applied within the Government organisations in order to equip the system users with the relevant knowledge.

Generally, knowledgeable users tend to use the system better than those with little knowledge. Moreover, having knowledge will encourage the system's users to be committed to their job. Therefore, **knowledge is seen as the antecedent for user commitment towards AIS effectiveness**.

ii. Top Management Support

In the context of the Malaysian Federal Government, top level management are more concerned with decision-making rather than the operation of producing accounting information. They are more interested in the accounting information rather than accounting data. Thus, their involvement and access to the AIS is broader when compared to middle and lower level of management. Generally, they have access to higher level reports in the system. These reports are needed to assist them in the decision-making process. However, the grounded fieldwork activities (e.g. entering data, sorting documents, reconciliation etc.) are performed by middle and lower management levels. Middle and lower management levels are viewed as active AIS users because their job scope requires them to actively use the system. Commonly, the top management's appreciation of the produced information and their call for a high quality of accounting information are seen by the active system's users as an

encouragement towards system usage. That support makes them more likely to perform well in order to ensure top management's requirements are fulfilled.

Furthermore, getting the right training that is relevant to their job scope is helpful in improving their knowledge. In practice, most of the decisions about training (e.g. attendance and budgeting) are made by the top management level. Furthermore, the top management has the power to spread and encourage a positive attitude amongst the middle and lower management, especially in encouraging effective use of the AIS (Thong et al., 1996). Hence, the top management's effort in improving the AIS is perceived as an influencing factor on positive usage of the system.

Overall, it is implied that the system's users need strong support from the top management to optimise their performance when using the AIS. Therefore, **top management support in this study is viewed as an antecedent for user commitment towards AIS effectiveness** rather than a factor influencing the AIS effectiveness.

iii. Culture

Culture is commonly referred to as a pattern of beliefs, shared values and the way people do something (Fitriati and Mulyani, 2015; Nongo and Ikyanyon, 2012). In the context of the Malaysian Federal Government, an appreciative and supportive attitude towards technology, an open door policy and a knowledge exchange culture are actively practised within the Government's organisations. These practices can be seen from the various programs (e.g. group discussion between ministries, promoting the enhancement of technology etc.) and plans being set by the AGD, as well as by

each ministry. It is believed that having these positive cultures can encourage the improvement of employees' performance.

In a real working life, AIS users need a highly positive working environment, as a better workplace, to neutralise stressful matters in the accounting and information system field. In addition, a strong positive culture can direct an employee to be better at their job and more willing to put in effort towards the organisation's performance. Therefore, **culture in the context of this study is proposed as an antecedent for user commitment**.

4.7.4 Antecedents for the Technology Support Function

i. Internal Expert

Internal experts are a group of people that provide support on specific matters within their field. In the context of AIS, the internal expert can be anyone from the technology side, as well as the accounting side. Most of the time, they are needed for maintenance, improvement and solving problems. Chalu (2012) discussed the role of auditors in assessing the quality of accounting information and subsequently provided suggestions for the AIS improvement. On the other hand, Pitt et al. (1995) stated the importance of information system department's support to assist the system's users in any technological matters.

In this study, the interviewees viewed the internal experts of AIS as a group of people that provide support towards the system's technical matters. As the AIS is a combination of both accounting and technology, the internal expert provides support in both areas in order to ensure the system is working as required. The support is provided by the AGD (i.e. the headquarters) as well as by each of the

ministries where the accounting office is located. It is common for the AGD to provide an expert in terms of the AIS management, maintenance and improvement, as well as an expert to handle any accounting matters related to the system. In addition to that, the accounting office at ministry level is allocated with IT personnel, by their respective ministry, to assist them in dealing with any technological problems. However, any matters related to the system will be referred to the internal expert at the headquarters. Not to confuse this with top management support, internal expert support is particularly focused on the technological part of the AIS. On the other hand, top management support concerns the system users' performance. Overall, the qualitative data of this study suggested that the **internal expert is an antecedent for technology support function towards the effectiveness of AIS.**

ii. External Expert

External experts in previous studies commonly refer to vendor or consultant. Both vendors and consultants are from the outside of an organisation. Normally, they are appointed with terms and conditions that are agreed by both parties (i.e. the organisation and the external expert). Previous studies (e.g. Kouser et al., 2011; Ismail, 2009; Thong et al., 1996) found mixed results on the relationship between external expert and AIS. While vendors are more likely to focus on providing a product (i.e. accounting software or AIS package), consultants are concerned with providing a service (i.e. advice about AIS related matters). However, the consultant also provides advice on the product best suited to the organisation's needs. Commonly, vendor is appointed for installation and early implementation of a new system. On the other hand, consultant is commonly appointed for the on-going

system to assist in a special matter over a specified period. In some cases, the consultant is also appointed during the adoption of a new system, in order to get advice on system development.

Based on the qualitative findings of this study, the interviewees assumed the external experts to be both vendor and consultant. Vendor is the system provider which is commonly appointed before the acquisition of an AIS and during early implementation of the system. On the other hand, consultant is appointed to give advice to the Government in accounting and technology matters. Both vendor and consultant are needed to assist in developing compatible AIS for all government organisations. In addition, their advice is also needed for an on-going system that is currently being used. Normally, problems related to the AIS that happened at responsibility centres will be reported to the accounting office. The accounting office will then forward the issue to the headquarters if they are unable to solve it. The headquarters, through its internal expert will check the problem and ask for help from the consultant if necessary. However, the external expert will not be available all the time as their appointment is on a contractual basis. Therefore, the Government is practising a transfer of knowledge strategy. This strategy is implemented by transferring the related knowledge from the external expert to the internal expert during the contractual term. However, the transfer of knowledge has some limitations, such as a time constraints. Therefore, in some cases, the external expert is still needed. In practice, the external expert is needed to assist in dealing with the AIS problems, either related to technological parts or the system structure. Therefore, the **external expertise is seen as an antecedent for technology support function towards AIS effectiveness**.

iii. Monitoring and Review

Monitoring and review are part of the internal controls applied by an organisation to check the performance of human capital, accounting information, accounting process, AIS and technology. Vaassen (2002) mentioned that monitoring activities can be conducted consecutively during the whole process or in a single assessment depending on the situation. Data quality checks and system audits are important in order to maintain the integrity and quality of the data (Sacer and Oluic, 2013).

Based on the qualitative findings of this study, the discussion about monitoring and review is focused more on the technology and AIS related matters (e.g. its SOP, guidelines, the system's performance etc.) instead of employees' performance. The reason for this is that monitoring and reviewing employees' achievement can be too general to be focused in terms of its impact towards the AIS effectiveness. For example, a person might perform well in his or her job (e.g. sorting, managing hard copy documents and analysing accounting reports) as overall, but not so well in using the AIS or the technological tools. Thus, overall performance does not only reflect the person's contribution towards the system but also covers other parts in their job scope.

On the other hand, monitoring and reviewing the technology and AIS related matters is aimed at ensuring that the technology performance is consistent with the on-going AIS. This should not be confused with the role of internal experts as both appear to have the same objective (i.e. to ensure the system performs well as required). Internal experts tend to support the system's users in solving the AIS related issues. Meanwhile, the purpose of monitoring and reviewing is to check the system's operation and performance. The check is performed by the system's users

from top and middle management levels, either as a recurring, continuous or one-off activity, depending on the specific objective they would like to achieve. For example, a document check is performed once a year to ensure the quality of data processed and produced by the AIS.

Apart from that, during the fieldwork, importance of having a benchmark for the on-going system was raised. The benchmark refers to a comparison of the Government's current system with the system used by other developing countries, in order to ensure that the system in use is not outdated. In addition, it is also good to have a comparison with the AIS used by developed countries as a guideline for further improvement of the current system. In the context of the Malaysian Government, comparisons between the Government's AIS and the AIS in other countries are performed as a one-off activity. The comparison is conducted when there is a need to do so (i.e. upgrading the system and during special reviews). The decision to conduct the activity is made by the top level of management because decision-making in the Government is based on a centralised structure. Furthermore, the system is specially customised according to the Government's requirements. Therefore, it requires a huge sum of money and comprehensive engagement from all levels of management.

Most importantly, any changes made to the system should also reflect its SOP. This is so that the system's users are aware of any new functions, rules or changes made to the system. Besides the importance of reviewing the system, technology and its SOP, the management is actively practising an inspection of documents and accounting records to ensure the quality of the processed data. In the Malaysian government organisations' practice, most of the accounting data is entered

by the staff at the responsibility centre. The original supporting document is kept by them. Further, the entered data is retrieved by the accounting office for further action to be taken (e.g. approval, producing report). Therefore, the inspection of documents and its record will be performed on a yearly basis at all responsibility centres throughout the country by the respective ministry. In addition to a document check, the inspection also aims to ensure system performance (e.g. integration of data, authorisation to access) are working as well as required and comply with the related procedures. Any weaknesses found will be reported to the headquarters for improvement.

Overall, the practice of monitoring and review has been discussed as crucial activities needed to identify the loopholes in the AIS. As technology evolves every day, the risk related to the technology might also get wider and unknown. Thus, monitoring and review is important in order to ensure the capability of the technology to support the AIS. Hence, the **monitoring and review is suggested as an antecedent for technology support function**. In other words, the monitoring and review, if effectively practiced, is seen as an enabler to strong technology that is capable of supporting the AIS operation and realising the achievement of an effective AIS.

4.7.5 Teamwork in AIS

AIS comprises of multiple processes that start from entering the data through to producing the accounting information. The multiple processes involve numerous functions in the AIS (e.g. entering, retrieving, authorising etc.) that are performed by several personnel in order to complete the whole process in the system. Practically,

the way the AIS works requires cooperation between its users. Therefore, teamwork is viewed as a very helpful practice to gather individual performance and technological capability and turn it into the expected outcome.

Apart from the process in the AIS, the system is also designed to be compatible with the structure of an organisation. In a large organisation, such as a government, the hierarchy of personnel, the centralisation of management and the reporting structure (e.g. functional, divisional etc.) requires a system that is suitable and capable of coping with their structure. In addition, the developed internal controls in the AIS should be in line with the structure of the organisation, such as the authorisation level to access the system and the segregation of duty to perform the accounting tasks. Logically, the hierarchical level, the various departments and the various locations need good teamwork practiced amongst employees in order to enhance not only the performance of the people, but also the performance of technology towards the AIS, too.

In the context of the Malaysian Federal Government, most of the processes in the AIS start at the responsibility centre. The responsibility centre is responsible for entering the accounting data and keeping the supporting documents. The responsibility centres are located throughout the country and are connected with their respective accounting offices through the AIS. In practice, the accounting data is entered in a system named *eSPKB* for recording expenses and *eTerimaan* for recording collections. However, there are also some transactions that are entered by the accounting office itself, such as the accounting office's expenses and collections. The responsibility centre reports to its respective accounting office at the ministry. On the other hand, the accounting office reports to the headquarters (i.e. the AGD).

The accounting office has access to all systems (i.e. *eSPKB*, *eTerimaan* and GFMAS) that are used to process and produce the accounting information. The entered data in *eSPKB* and *eTerimaan* is retrieved using GFMAS at the accounting office for processing and producing information. While the responsibility centre is responsible for assisting its respective accounting office, the accounting office is responsible for monitoring and providing advice to their responsibility centre. The segregation of duties and authorisation level, as well as the reporting structure, represent the structure of the Government. Since the accounting processes involve several personnel from numerous departments that are located throughout the country, good communication and relationships between the personnel are needed in order to support individual and technology performance. However, in the absence of good teamwork, the AIS can still effectively operate with highly committed users and adequate technology support. As such, teamwork is seen as an enabler for a more effective AIS.

Nevertheless, the complex process and the organisational structure can also slow down progress in completing accounting tasks. In addition, the complexity of the process and the organisational structure may diminish the contribution of individuals and technology towards the system. Moreover, the complexity of the process, such as using multiple subsystems, may sometimes create another risk in terms of system integration and data transfer. On the other hand, in a complex organisational structure, people can be too focused on their job scope while ignoring the overall functions and objectives of the AIS. The communication and relationships in a complex organisational structure can also be limited within departments or same

levels of management. It is common in big organisations to see a gap between the top, middle and lower management levels.

Overall, **teamwork is seen as a moderator of the relationships between the critical factors (i.e. user commitment and technology support function) and AIS effectiveness**. In other words, teamwork may encourage more contribution, from the AIS users and the technology, towards the system effectiveness or vice versa.

4.7.6 Organisational Characteristics

i. The Organisation's Size

Organisation size reflects the complexity of an organisation's structure and its accounting process, the support from management and experts, the resources, the facilities, the gap between management levels and the volume of transactions. Commonly, a large size organisation has a complex accounting process due to its having a complex hierarchical structure with voluminous transactions, when compared to a smaller organisation. In addition, the complexity of organisational structure sometimes creates gaps between the levels of management. However, a large organisation usually has strong support from management and experts, as well as adequate resources and facilities because of the availability of bigger budgets and power. As such, the employees in a large organisation might have different views towards the AIS when compared to the employees in smaller organisations.

Prior to 2013, the Malaysian Federal Government only had 11 accounting offices allocated to 10 big ministries. For the remaining ministries, accounting matters were managed by the AGD. The criteria of ministries that are given the

authority to have a specific accounting office are large, voluminous transactions and specific functions (e.g. revenue collection such as in the custom department). However, as preparation for the transition of accounting treatment from cash basis accounting to accrual-based accounting, the Government had established another 15 accounting offices for 15 ministries in 2013. Therefore, the size of each ministry in this study is determined based on the nature of the accounting office (i.e. existing or newly established).

ii. Background of the Department

The environment surrounding a particular department may differ from its counterparts. Each department might have differences in culture and the way they work. In the Malaysian Federal Government, there are three main departments that are involved in managing accounting matters: the headquarters (i.e. the AGD); the accounting office; and the responsibility centre. The headquarters is responsible for overseeing the overall performance of the Government's accounting including the AIS, as well as governing accounting related matters from top level management's perspective (e.g. policy development, technology adoption etc.). On the other hand, daily accounting processes are performed by the accounting office and its responsibility centre. Accounting offices are located at every ministry as well as the headquarters (i.e. the AGD). Whereas, the responsibility centres are located throughout the country. The accounting office's authorisation to access the AIS is broader than the responsibility centre. The accounting office also acts as a mediator between the responsibility centre and the headquarters (i.e. the AGD). Commonly, the accounting office has more staff and better facilities when compared to its

responsibility centres (i.e. especially those that are located at remote areas). As such, the difference in resources, expectations and experience between the AIS users at different departments may affect the way the system's users perceived the system and its environment.

4.7.7 Individual Characteristics

Individual perceptions might vary from one to another depending on their knowledge and experience. In the context of this study, the interviewees during the qualitative fieldwork believed that having an accounting background is helpful in operating the system and performing accounting tasks. However, not all of the AIS users have an education qualification in accounting. Some of them have mixed accounting qualifications or qualifications from other fields, such as management, business, marketing etc. For example, the user may have a bachelor's degree in accounting and a master's degree in human resources.

Furthermore, the level of education might also cause variations in individual opinions. As the appointment in the Government is commonly based on the individual's education level or qualifications, the variation of education level is also reflected in the position of that person in an organisation. Each position has their own responsibility, with a specific point of view that a person has according to his or her level of education obtained.

4.8 PRELIMINARY REPORT OF QUALITATIVE FIELDWORK

Overall, a majority of interviewees agreed that the current system is satisfactory (except for several minor issues that are solved and improved on an on-going basis)

and hope that the AIS effectiveness can be sustained regardless of any upgrades made to the system in future. However, some other factors that were highlighted by the interviewees are either partially practised or not effectively practised in the Malaysian Federal Government, such as the appreciation of accounting reports, the effective use of the accounting information and the audit on the AIS. The appreciation of accounting reports and the effective use of accounting information should be improved simultaneously and included in the Government's strategy. Nevertheless, the current practice does not show effective execution on these factors.

On the other hand, the presence of periodic audits on the AIS is not in the knowledge of the accounting departments. It is either that the audit is conducted internally by other departments in the AGD or substituted by other techniques. However, having a specific technical audit on the system may offer more benefits in terms of continuous improvement to suit any advancement in technology, strengthening the security and control, as well as meeting the system's users' requirements. AIS audit should be practised in order to ensure the performance of the system is well maintained to sustain its effectiveness. The report of the AIS audit should be shared with the accounting departments because their suggestions as a user will help to overcome the weaknesses and deficiencies of the system.

The summary of the report with regards to the preliminary findings from the qualitative part of this study has been shared with the participants, who were involved during the unstructured preliminary fieldwork and semi-structured interviews, to obtain their feedback. The report was sent by email prior to survey implementation. In response to that, no disputes were raised, which suggested that the findings were satisfactory enough to proceed with the survey.

4.9 SUMMARY

Overall, this chapter has explained the steps taken in analysing the qualitative data, the processes involved and the qualitative findings of this study. The qualitative part of this study is comprised of unstructured preliminary fieldwork and semi-structured interviews. The data obtained from both aspects of the fieldwork were analysed using a coding technique. In summary, the qualitative findings of this study highlighted three dimensions of AIS effectiveness: system quality; information quality; and benefit/usefulness of the system. Furthermore, there are nine variables suggested to have impact on the phenomenon of the critical factors of AIS effectiveness. The proposed dimensions and variables are summarised in Table 4.11.

Table 4.11: The Summary of Preliminary Proposed Variables/Dimensions

Description	Proposed Dimension/Variable
AIS Effectiveness	- AIS Effectiveness i. System Quality ii. Information Quality iii. Benefit/Usefulness of AIS
Critical factors of AIS effectiveness	- User Commitment - Technology Support Function
Antecedents for user commitment	- Knowledge - Top Management Support - Culture
Antecedents for the technology support function	- Internal Expert - External Expert - Monitoring and Review
Moderator of the relationships between the critical factors and AIS effectiveness	- Teamwork

The next chapter discusses the proposed research model of this study. Specifically, the chapter explains the measurement details for each variable proposed in the research model.

CHAPTER 5: RESEARCH MODEL

5.1 INTRODUCTION

This chapter proposes a comprehensive research model developed from the literature review and the qualitative findings of this study. The comprehensive research model illustrates the phenomenon of the critical factors of AIS effectiveness, which includes the determinants for the critical factors. Further, the research model proposes an inclusive measurement of AIS effectiveness by incorporating three dimensions in the measurement: system quality; information quality; and benefit/usefulness of AIS. The proposed measurement of AIS effectiveness reflects the general conceptual definition of system effectiveness by evaluating system user satisfaction towards the three dimensions. Also, this chapter elaborates on the operationalisation of the proposed variables in the research model. In other words, indicator items that are used to measure each variable are explained accordingly in this chapter.

5.2 PROPOSED RESEARCH MODEL

The literature review reported various ways of measuring AIS effectiveness, as well as its critical factors. Based on the literature review and the qualitative findings, this study inclusively gathers system quality, information quality and benefit/usefulness of the system as a measure for the AIS effectiveness. The measurement is based on a user satisfaction scale towards the three dimensions, which reflects the widely cited conceptual definition of system effectiveness (i.e. meeting system users'

requirements). The combination of these dimensions offers wide and in depth context of AIS effectiveness.

Furthermore, the critical factors of AIS effectiveness that are suggested according to the preliminary findings of this study are anchored by two important components of the system, which are people and technology. Specifically, system effectiveness is suggested to depend on system user commitment and the technology function to support the system. Moreover, the accounting process and the organisation structure require teamwork in order to complete the whole process in the AIS. Therefore, teamwork is proposed to be a moderator towards the impact of the critical factors on the AIS effectiveness.

On the other hand, some of the factors reported in previous studies that have an impact on information system or AIS are found, in the preliminary findings of this study, to be the antecedents towards the identified critical factors influencing the AIS effectiveness in an on-going system in use. The preliminary proposed antecedents for user commitment are knowledge, top management support and culture. Besides, the preliminary proposed antecedents for technology support function are internal experts, external experts and monitoring and review activities.

Overall, this study proposes a comprehensive research model illustrating the antecedents for the critical factors of AIS effectiveness. This research model is comprised of two critical factors of AIS effectiveness with three dimensions to proxy the system effectiveness measurement, six antecedents for the critical factors, and one moderator of the relationship between the critical factors and AIS effectiveness. In addition, the variance of AIS users' perceptions towards the system is also assessed according to organisational characteristics (i.e. organisation size and

departmental background) and individual characteristics (i.e. educational level and background). The differences in characteristics may be the reason for the mixed results found in prior studies. Figure 5.1 illustrates the proposed comprehensive research model of this study.

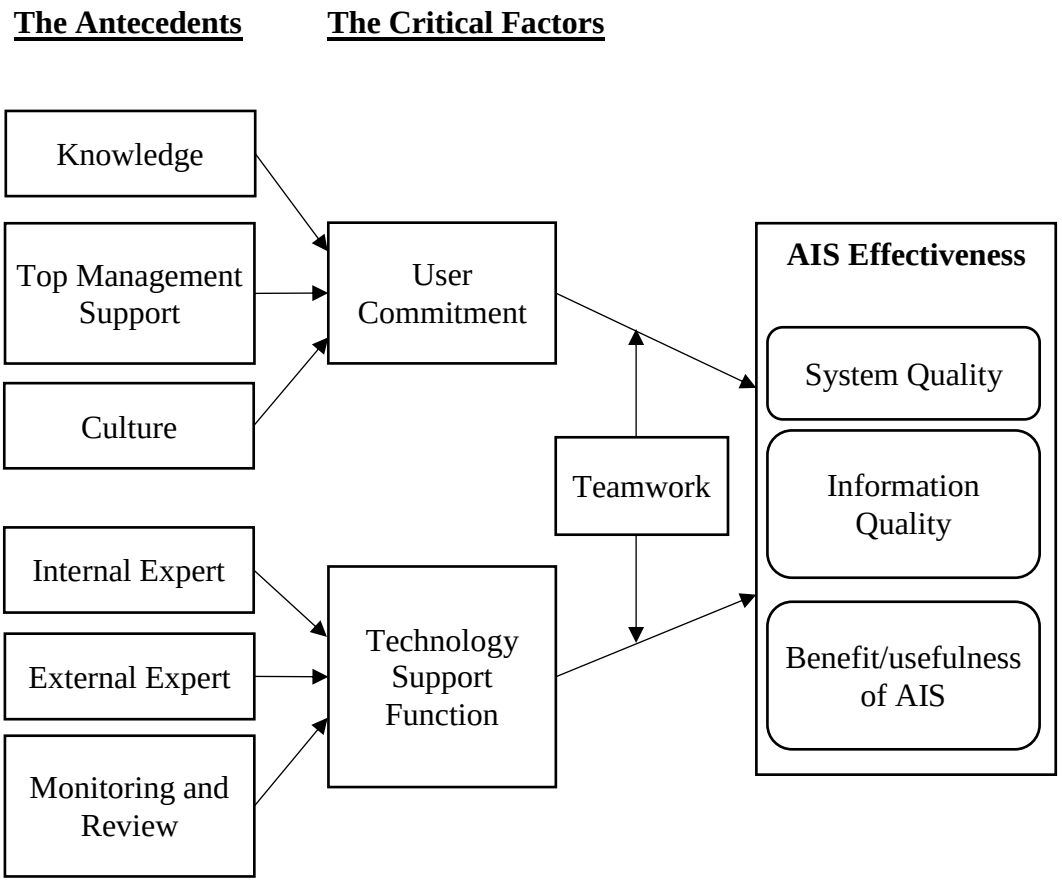

Figure 5.1: Proposed Research Model for the Phenomenon of the Critical Factors of AIS Effectiveness

5.3 OPERATIONALISATION OF VARIABLES

The assessment of all independent and dependent variables that are proposed in the research model of this study is based on multiple items measure. Each item is evaluated using a five-point Likert-scale. The AIS effectiveness is measured according to a user satisfaction scale. The scale ranged from *very dissatisfied* to *very*

satisfied. On the other hand, the critical factors have two roles; as independent variables for AIS effectiveness and dependent variables for its antecedents. In particular, the critical factors, its antecedents and a moderator variable (i.e. teamwork) are measured with two side-by-side columns assessing perceived importance and perceived performance of each item. The perceived importance scale ranged from *not important* to *very important*. Meanwhile, the perceived performance scale ranged from *poor* to *excellent*.

5.3.1 AIS Effectiveness Measurement

AIS effectiveness is a dependent variable of the critical factors in this study. The specific criteria of an effective system are identified according to the literature review and the qualitative findings of this study. Furthermore, the development of the instrument to measure AIS effectiveness also considers various information system models related to success, acceptance and effectiveness that have been discussed in previous studies. Practically, the system must first be successfully implemented and accepted before it can be effectively operated. Thus, maintaining the criteria of system success with some additional criteria that emerge during the system evolvement reflects the effectiveness of the system. Based on the qualitative findings, most of the interviewees agreed that an effective system is a system that meets their requirements and satisfies them. In addition, the system is viewed as effective when it is beneficial to its users. These views are consistent with previous studies (e.g. Kouser et al., 2011; Salehi et al., 2010; Sajady et al., 2008; Nicolaou, 2000) about system effectiveness. Therefore, the measurement of AIS effectiveness is measured by user satisfaction towards the three dimensions: system quality;

information quality; and benefit/usefulness of the system. After refining a long list of system effectiveness criteria, this study proposed 13 items that make up the three dimensions of AIS effectiveness measurement.

i. System Quality Measurement

System quality is commonly measured, in prior studies, in terms of its capability, performance, function and application. Previous studies discussed a variety of system quality criteria in which some of the criteria (i.e. system integration, flexibility, system security) are suggested in this study to be the factor that lead to the quality, instead of representing it. System quality criteria in this study are refined according to the findings from the qualitative fieldwork. Specifically, the criteria represent the system's users' wants and expectations about a good system. The refined criteria are user friendliness, ease of understanding, ease of use, processing speed, and an ability to produce information according to their need. These criteria are consistent with the criteria discussed in previous studies (i.e. Cohen et al., 2016; Rahayu, 2012; Ismail, 2009; Ifinedo, 2006; Ifinedo and Nahar, 2006). Therefore, in the context of this study, system quality is measured based on the following specific criteria:

1) The system is user friendly.
2) The system is easy to understand.
3) The system is easy to use.
4) The processing time (i.e. speed) of the system.
5) The system is able to produce reports in a required format

ii. Information Quality Measurement

A high quality system is expected to produce high quality information. Medina et al. (2014) asserted that the quality of information allows better decision-making. The common criteria used by prior researchers (e.g. Fitriati and Mulyani, 2015; Rapina, 2014; Komala, 2012; Rahayu, 2012; Dehghanzade et al., 2011; Ismail, 2009) to measure the information quality are reliability, accuracy, completeness, timeliness, relevancy and consistency. These criteria are found to be similar to the interviewees' opinions about the quality of information that they expect to get from the system. Some of the criteria are combined as it reflects the same measure. For example, timeliness and reliability of information represent relevancy. Thus, the information quality in this study is assessed based on the following information characteristics:

1) No doubt
2) Accurate
3) Completeness (all transactions are captured accordingly)
4) Relevant for use in decision-making

iii. Benefit/Usefulness of AIS Measurement

The application of technology in accounting processes is intended to provide opportunity and benefit to its users. Previous studies mentioned numerous benefits that are gained from the implemented system, such as performing the accounting function in a modern way (Belfo and Trigo, 2013; Pierre et al., 2013; Salehi et al., 2010), assisting in decision making with more reliable and relevant information (Kharuddin et al., 2010), effectively managing organisation's business transactions (Dalci and Tanis, 2009), enhancing productivity (Sacer and Oluic, 2013) and

improving the performance of accounting activities (Ilias and Zainudin, 2013). Based on the findings from the qualitative part of this study, generally, the interviewees believed that the AIS reduces hard copy submissions, speeds up the accounting process, automates some of the accounting functions, minimises human error and supports decision-making tasks. Therefore, the system benefit/usefulness in this study is measured as follows:

1) The system improves individual productivity.
2) The system improves the decision-making process.
3) The system minimises unintentional human error.
4) The system reduces hard copy submissions (it is paperless).

5.3.2 The Critical Factors of AIS Effectiveness

The critical factors in this study act as independent variables for AIS effectiveness and dependent variables of its antecedents. As proposed in the research model of this study, the critical factors are user commitment and technology support function.

i. User Commitment

Commitment often refers to a person's engagement and dedication. Previous studies (e.g. Fitriati and Mulyani, 2015; Indahwati, 2015; Rapina, 2014; Syaifullah, 2014; Saleh, 2013; Rahayu, 2012) reported that commitment has a positive impact on AIS. The measure of commitment has been conducted in a variety of contexts, such as individual level, organisational level, differentiation in management level and so on. Logically, commitment comes with the feeling of responsibility that committed

employees get from their job. A responsible person commonly has ethical values when performing his or her job.

In practice, AIS users are provided with the system's manual, procedures, and related regulations that guide them on how to do their task in the right way. In addition, these guidelines are considered among the important things that a system should have in order to operate it properly (Romney et al., 2013). However, having the guidelines is not enough if the system's users do not comply with them. Consistent compliance on the related procedures and regulations is said to be the important factor for AIS effectiveness (Saeidi et al., 2014). In order to comply with the related guidelines, it is important for the system's users to understand the related regulations, as well as have knowledge of the functions and processes of the system.

Furthermore, the additional factor suggested in the qualitative finding of this study, which is an effective use of AIS, is applied under this variable. The effective usage is presented by a prioritisation of the system usage. In other words, dedicated system users are more likely to prioritise the usage of the system when compared to less committed users.

In addition, the system's user's involvement in terms of their active participation in decision-making is believed to encourage the sustainability of information quality, system quality as well as gaining benefit from the system. As such, user commitment in this study refers to individual commitment towards:

1) Compliance with Standard Operating Procedures (SOP), policies, standards, rules and regulations.
2) Prioritise the use of AIS.

3) Actively involved in the decision-making process (i.e. within a group, a department or in higher management levels)

ii. Technology Support Function

Technology support function in this study represents the capability of technology to support the AIS. Nowadays, AIS is mostly supported by technology. The advancement of technology offers more opportunities for better AIS but also comes with risks. Byrd and Turner (2000) asserted that infrastructure is among the main concerns of IT management. The importance of facilities and infrastructures has been discussed in prior studies (Indahwati, 2015; Ramazani and Allahyari, 2013; Sacer and Oluic, 2013; Wiechetek, 2012) in terms of its suitability and compatibility. Ramazani et al. (2014) suggested accounting software compatibility as one of the highly considered matters concerning the AIS. Ramazani and Allahyari (2013) and Wiechetek (2012) emphasised the importance of suitable components towards the operation of a system. However, the suitability and compatibility of the components should be considered during the adoption stage of the system. In the context of an on-going system, the organisation should focus on maintaining the capability of the system to support the required accounting operations. AIS maintenance in the Malaysian Government is managed by the headquarters (i.e. the AGD) as well as by the ministry itself. Overall, the AGD is responsible for ensuring the installed technology is capable of supporting the operation in the AIS.

Furthermore, it is widely acknowledged that ease of use, user friendliness and ease of understanding are among the most common criteria sought after by the AIS users or any information system and IT users. It is not a significant problem to have

these features in a simple system. However, a complex structure of government often requires complex AIS in order to cater for the government's structure and transaction volume. Therefore, sophisticated technology is required in order to maintain the easiness features of the system. Additionally, sophisticated technology has the ability to offer better security and control function with a strong protection and back up of data. Several studies (e.g. Kouser et al., 2011; Ismail, 2009) discussed the sophistication of technology in terms of the number of AIS applications available in an organisation. The number of AIS applications may represent the sophistication of the technology from the context of system adoption and implementation. However, since this study examines the on-going system in use, technology sophistication is viewed according to the following measures:

1) Up-to-date hardware and software.
2) Strong data protection technology and back-up.
3) Integration between systems in the Government (i.e. GFMAS integrated with other e-Government system).

5.3.3 Antecedents for User Commitment

i. Knowledge

Knowledge in this study is suggested to be the antecedent for user commitment. Knowledge enables a person to perform their duties in a good manner, if effectively applied. In most cases, a knowledgeable person tends to use any system with less anxiety, a high level of confidence and a readiness to be involved in the decision-making process. Knowledge in this study is measured based on AIS user understanding of the accounting standards, system function and process in AIS. In

addition, knowledge is also represented by the system's user's academic qualifications and experience. In particular, knowledge is measured as follows:

1) AIS user understands the accounting standards.
2) AIS user has academic qualifications in accounting or finance (with basic accounting).
3) AIS user has experience in accounting and the system.
4) AIS user understands the functions and processes in the system.

ii. Top Management Support

Top management support is needed in almost all situations in an organisation. The need for their support ranges from daily tasks to specific projects. Previous studies (i.e. Imtiaz et al., 2013; Komala, 2012; Ismail, 2009; Thong et al., 1996) measure top management support based on resource provision, a good environment, authority, participation and involvement.

In most situations, training is decided and provided by the top management. The importance of training for continuous good performance is widely acknowledged. In the context of the Malaysian Federal Government, training is provided by the headquarters (i.e. AGD) as well as internally by the ministry, depending on the need and budget. The interviewees during the qualitative fieldwork discussed the importance of manager's support to encourage their subordinates to attend the provided training. Specifically, sending the right personnel is important for ensuring the training provided is not wasted.

In addition, the interviewees also mentioned the importance of accounting information appreciation to encourage AIS usage. As the important members in

decision-making, top managers should demonstrate effective utilisation of the accounting information produced by the AIS. Their appreciation and utilisation of the information implies the importance of the AIS and motivate the system's users to prioritise the system usage.

Moreover, top management encouragement towards the improvement of AIS is reflected in their effort to provide a better system for the system's users. Their effort is seen as supporting the system's users to be more committed to their work. Therefore, top management is measured as follows:

1) Manager/supervisor encourages employees to attend training.
2) Top management appreciate and utilise the information produced by the AIS.
3) Top management encourages the improvement of the AIS.

iii. Culture

The culture surrounding an organisation's environment generally affects the way the organisation and its employees operate. AIS is a system that connects people, departments and organisations in the Government. Hence, the system requires a positive culture for a better environment in order to encourage effective operation. Bad culture that influences the working environment may affect employees' performance.

Previous studies (e.g. Fitriati and Mulyani, 2015; Wiechetek, 2012) discussed culture from the perspective of project culture and organisational culture. Specifically in the context of the Malaysian Federal Government, supportive and sharing knowledge culture is actively practised within the Government. The

interviewees stated that a good culture is needed within an organisation, not just for AIS performance, but also for overall performance. Therefore, culture in this study is evaluated according to the following measures:

1) Appreciative and supportive environment towards technology enhancement.
2) Open door policy to encourage employees to seek advice, offer suggestions and actively exchange ideas.
3) Transfer of knowledge from internal expert to other AIS users.

5.3.4 Antecedents for the Technology Support Function

i. Internal Expert

Prior studies discussed internal expert in a variety of roles, such as internal auditor, councillor (i.e. politician), the IT department and accountant. Chalu (2012) stated the importance of auditor and councillor (i.e. politician) towards AIS development in the context of local authority organisations. In practice, specific technical support is crucial as the system users are commonly relying on the expert for technical matters (Pitt et al., 1995).

The internal expert in the context of this study mostly refers to the headquarters (i.e. the AGD) and the IT department. The qualitative findings suggested these two parties as being the most important internal expert that assist the AIS users with the system's technical issues. In addition, these parties play a crucial role in ensuring the system works as well as the Government requires. Moreover, the IT department should provide adequate support and prompt feedback, for any technological issues that occur, in order to sustain the technology performance for

the benefit of AIS. On the other hand, the headquarters (i.e. the AGD) should always adequately provide technical support for technological matters, as well as for accounting matters. Hence, the person in charge has to be experienced in order to solve the AIS related matters in a short period of time. As such, the internal expert in this study is assessed as follows:

1) IT department provides adequate technical support.
2) IT department gives prompt feedback.
3) The headquarters (i.e. the AGD) provides adequate technical support.
4) The person in charge at the headquarters (i.e. the AGD) is experienced.

ii. External Expert

Consultant and vendor are among the external expert that is typically discussed in prior studies (e.g. Zhang et al., 2013; Chalu, 2012; Kouser et al., 2011; Ifinedo and Nahar, 2006; Thong et al., 1996). Adequate technical support from the external expert is crucial in solving any cases that cannot be solved by the internal expert. Furthermore, due to the complexity and uniqueness of the government's transactions and activities, the external expert's understanding of the government's requirements is crucial in order to provide useful support and advice. In order to do so, the external expert should be experienced. Therefore, the external expert in this study is evaluated based on the following measures:

1) The vendor/consultant provides adequate technical support.
2) The vendor/consultant clearly understands the organisation's (i.e. ministry and the Government) requirements.
3) The vendor/consultant is experienced.

iii. Monitoring and Review

Monitoring and review activities are discussed as part of internal control (Vaassen, 2002). The activities play important roles in the AIS to ensure the continuous quality of the system and information, as well as to sustain the system performance. Monitoring and review are often discussed in previous studies (e.g. Sacer and Oluic, 2013; Chalu, 2012) in terms of work performance reviews, system audits and financial report audits. However, in the context of this study, monitoring and review is solely focused on the system, instead of its users. Monitoring and reviews of AIS in the Malaysian Federal Government is conducted internally by the accounting department of each ministry and the headquarters (i.e. the AGD).

Among the discussed monitoring and review activities during the qualitative fieldwork is benchmarking. Benchmarking refers to a comparison or reference in what should be achieved and done. Benchmarking has been discussed by previous researchers (e.g. Shaul and Tauber, 2013; Ngai et al., 2008) in the context of ERP. Based on the findings from the qualitative data of this study, benchmarking is done by comparing the current on-going system in the Government with other organisations' systems (i.e. other countries). Benchmarking is used as an indicator to show the status of the current system, as well as for the development of the upcoming system. Especially in a complex structure of government, the implemented system may no longer be effective when compared to other countries. For example, the new technology that is adopted by other countries may offer a faster processing system with better data management capabilities. Thus, comparison with other organisations or other countries will help to identify such opportunities.

Furthermore, monitoring and review activities in the Malaysian Federal Government practice also cover the technical accounting aspects, such as document inspection. In addition, one of the interviewees mentioned the importance of system audits for ensuring sustainable performance of the system. However, the presence of the system audit activity is not in the knowledge of the accounting department. This activity may be substituted by other methods or conducted by other departments in the AGD. Moreover, management should also periodically review the manual guidelines and SOP to ensure any changes made to the system are updated and documented accordingly. Overall, the monitoring and review in this study is measured as follows:

1) Comparing the current AIS with AIS in other developing countries to ensure that the system in use is not outdated or using obsolete technology.
2) Comparing the current AIS with AIS in other developed countries to encourage system improvement.
3) Performing inspection of documentation and procedure (*naziran*).
4) System audit (system check) in order to ensure the system operates as required with a strong internal control and security.
5) Periodic review of the manual guidelines and SOP of the AIS to ensure any changes made to the system are documented and updated accordingly.

5.3.5 Teamwork as a Moderator of the Relationships between the Critical Factors and AIS Effectiveness

Teamwork often refers to a group of people that work together to achieve their main goal. In AIS, teamwork practice is needed to coordinate the accounting process and organisation structure in the system's operation. Therefore, strong teamwork between the employees is believed to smooth the AIS operations and vice versa. Thus, teamwork in the proposed research model of this study is treated as a moderator of the relationships between the critical factors and AIS effectiveness.

Teamwork in a workplace can be seen from the communication among employees. In particular, the qualitative findings of this study suggested that effective communication between top management, middle management and lower management implies good teamwork practice. In addition, sharing information among employees reflects good teamwork. Furthermore, teamwork practice can also be viewed in terms of the relationship and cooperation between the AIS related parties. Relationship and cooperation connects individuals and organisations (Myers et al., 1997). In the Malaysian Federal Government, the Government's accounting structure comprises of the headquarters (i.e. the AGD), the accounting office at ministry level and the responsibility centre. Based on the qualitative findings, some of the interviewees mentioned that the accounting process can also be affected by other departments' performance (e.g. the finance department, the human resource department). Generally, relationships and cooperation are the mediums that connect the AIS users and the related departments. As such, relationship and cooperation in this study is viewed in terms of good relationships and high cooperation among the AIS users.

In summary, teamwork in this study is evaluated based on effective communication, good relationships and high cooperation. In detail, teamwork is measured as follows:

1) Effective communication between levels of management (i.e. top, middle and lower).
2) The AIS users actively share useful information among employees (while considering confidentiality) to update any necessary information.
3) There is a good relationship between the AIS users in the accounting office.
4) There is a good relationship between the accounting office and other departments within the organisation (i.e. ministry).
5) There is high cooperation among the AIS users within the Government.

5.3.6 Organisational Characteristics – Size and Departmental Background

Organisation size and departmental background are discussed as organisational characteristics that might lead to differences in the AIS user's environment. Thus, the AIS users' perception towards the system may also vary. As such, the variance of perceptions is assessed using categorical measures. The size of organisation is categorised as small and large ministries. On the other hand, departmental background is evaluated based on either the department representing the accounting office or the responsibility centre. Table 5.1 illustrates the categorical measures used to evaluate the organisational characteristics.

Table 5.1: Categorical Measures for Organisational Characteristics

Characteristic	Categorical Measure
1) Organisation Size	i. Small ministry ii. Large ministry
2) Background of Department	i. Accounting office ii. Responsibility centre

5.3.7 Individual Characteristics – AIS User's Qualification of Educational Background and Educational Level

The AIS users' perception towards the system is also influenced by their qualification of educational background and educational level. Those that have a qualification solely in accounting education background may understand the AIS better than those with a non-accounting education background. In addition, the level of education may lead to different views of the AIS and its environment. Therefore, the AIS users' perception that will vary due to qualification of educational background and education level are examined accordingly.

Specifically, the AIS users' qualification of educational background is measured based on either their qualification of education solely in an accounting background or otherwise (mixed accounting and other education background or non-accounting background). Further, the education level refers to Ph.D., master's degree, bachelor's degree, diploma/*STPM*/A-Level, *Sijil Pelajaran Malaysia (SPM)* (i.e. equivalent to high school level) and other levels of education, if any. Both qualification of educational background and educational level are examined using two categorical measures as presented in Table 5.2.

Table 5.2: Categorical Measures for Individual Characteristics

Characteristic	Categorical Measure
1) Qualification of Educational Background	i. Solely in accounting field. ii. Mixed (i.e. accounting field and other fields) or Non-accounting field.
2) Education Level	i. Ph.D, Master's degree and Bachelor's degree. ii. Diploma/*STPM*/A-Level, *SPM* and other.

5.4 SUMMARY

This chapter discussed the proposed research model of this study. The operationalisation of each variable is comprehensively discussed in order to explain the measurement used in this study. *AIS effectiveness* is a dependent variable for the critical factors, which are *User Commitment* and *Technology Support Function.* In particular, the *AIS effectiveness* comprises of three dimensions that are also examined individually as three separate dependent variables. The critical factors (i.e. *User Commitment* and *Technology Support Function*) also act as dependent variables for its antecedents. The antecedents comprised of six independent variables, which are *Knowledge*, *Top Management Support*, *Culture*, *Internal Expert*, *External Expert* and *Monitoring and Review*. Furthermore, there is one moderator variable (i.e. *Teamwork*) between the critical factors and the *AIS effectiveness*. Generally, each variable is measured using multiple items that range from three to five indicator items. The research model and its measurements that are explained in this chapter were transformed into a survey questionnaire for further quantitative assessment. The next chapter now discusses in details about the quantitative part of this study, including its implementation, analyses and findings.

CHAPTER 6: A QUANTITATIVE STUDY – IMPLEMENTATION AND FINDINGS

6.1 INTRODUCTION

This chapter describes the implementation and analysis of the quantitative part of this study. The questionnaire was developed from the literature review and qualitative findings of this study. After that, the questionnaire was refined and implemented after performing several tests prior to actual data collection. The data collection conducted in this study is discussed and the survey response progress is reported in detail, following the best practice for scientific research. Further, data examination and analysis are performed according to the proposed research model. As a result, the findings are comprehensively presented in this chapter.

6.2 IMPLEMENTATION OF RESEARCH DESIGN FOR THE QUANTITATIVE STUDY

The quantitative part of this study started with the development of a survey questionnaire. The questionnaire was developed based on prior research instruments, the literature review and the findings from the qualitative part of this study. Generally, the quantitative part offers a statistical type of data on a larger scale. The gathered data presents opinions and perceptions of accounting personnel from all levels of the Malaysian Federal Government organisations throughout the country. Table 6.1 explains the summary of action taken based on the research design of this study.

Table 6.1: A Summary of Implemented Research Design for the Quantitative Study

Method/Stage	Implementation
Quantitative Study	Data Collection, Phase III: Survey Questionnaire A large scale of survey was conducted through a survey questionnaire approach for the Malaysian Federal Government.
February 2016	- Pre-test survey questionnaire was performed to check the appearance and understandability of the questions.
March 2016	- Pilot survey was conducted specifically with some respondents from the population to check the reliability of the questions in the questionnaire.
March 2016	- Final check was performed to ensure that the questionnaire is ready to be distributed.
April to May 2016	- Actual survey was launched and distributed to all accounting personnel in the Malaysian Federal Government.
Statistical test	Data Testing The collected data was statistically tested in order to answer the research questions and achieve the objectives of this study.

6.3 RESULT OF QUESTIONNAIRE REFINEMENT

6.3.1 Result of Pre-test Survey

The pre-test of this study was conducted in two stages. The pre-test started with academics and practitioners from a non-accounting field and continued with people from the accounting field.

The first stage, the pre-test, was conducted in February 2016 with academics, research students and practitioners from various fields. The purpose of this pre-test was to check wording, timing, understandability and order of the questions. The first stage of the pre-test was conducted face-to-face and online with postgraduate research students and practitioners from a non-accounting field to get a general perspective about the appearance, wording and understandability of the questions. Generally, the suggestions pointed to the use of short and precise sentences, ease of understanding, clear instructions, attractive appearance (i.e. a proper heading for

each section) and the order of the questions. Following the suggestions, some modifications were made as shown in Table 6.2.

Table 6.2: Questionnaire Refinement After Pre-tested with the Non-Accounting Field

Section	Question Number	Amendment/Correction
2	Instruction	▪ The instruction was rephrased and additional sentence was inserted to further explain on how to answer the column of *Perceived Importance* and *Perceived Performance*. The additional inserted sentence is *Both columns should be answered independently and do not reflect each other's answer*.
2	Column instruction	▪ The sentence of *Opinion about the people/organisation/technology performance in your organisation* was rephrased to *Your opinion about the performance, of each factor listed, in your organisation.*
2	Column heading	▪ The heading of *Perceived importance* and *Perceived performance* were added to each of the factors' categories.
2	B). 3. ii	▪ The word *change* in the question about *Open door policy to encourage staff to seek advice, offer suggestions and actively change ideas* was corrected to *exchange*.
3	All	▪ Respondent's profile section that initially in the first page of the questionnaire was moved to the end.
3	3	▪ The sentence of *Totally in other than accounting background* was changed to *Non-accounting field*.
3	4	▪ *Highest qualification of educational level* and *Professional qualification* was separated into question 4 and 5. The following questions were re-numbering accordingly.
3	10	▪ *Total number of years working experience (public and private sector)* was rephrased to *Have you ever worked in the private sector before joining the government/public sector? Yes, please state the number of year(s) you worked in the private sector. Otherwise, no*.

Further, according to Dillman (2000), shortening the questionnaire and designing it to be as convenient as possible to be answered by respondents may increase the respondents' interest in participating and completing the survey. Therefore, the questionnaire was pre-tested with academics and practitioners from the accounting field, in order to get more specific views about the content of the questionnaire. The comments mainly emphasised on removing and combining the

redundant questions. In addition, some of the questions were rephrased to improve presentation and make the meaning more precise. The amendments are shown in Table 6.3.

Table 6.3: Questionnaire Refinement After Pre-tested within the Accounting Field

Section	Question Number	Amendment
1	A, B and C	▪ The questions were rephrased accordingly to make it short, precise and easy to understand.
1	A	▪ The question of *The system is user friendly* and *The system is easy to understand* were removed as it redundant with the question of *The system is easy to use*.
1	B	▪ The question of *The information provided by the system has no doubt* was removed as it has represented by the accuracy of the information as stated in the question about *The information is accurate (no doubt).*
2	A). 1	▪ *System user commitment* was changed to *User Commitment* due to consistency purpose.
3	Newly added	▪ Other comments and opinions section was added at the end of the questionnaire to give some space for the respondents to give their additional point of view, if any.

6.3.2 Result of Pilot Survey

Pilot survey of this study was conducted in March 2016 with some accounting personnel from the population of this study. The purpose of this pilot survey was to assess respondents' understanding about the questions, as well as the pattern of their answers, in much closer detail from the Government's accounting personnel.

The survey was conducted online using a web-based questionnaire. Additional space was added at the end of the questionnaire to allow any comments from the respondents. The online survey link was sent by email to 58 accounting personnel at the accounting office of the Ministry of Health and Ministry of Plantation, Industries and Commodities, Malaysia. Following delivery, respondents

had three weeks to complete the survey. The respondents were allowed to answer the survey at any time, either to complete it at once or partially answer and revisit the link to complete it at a later time within the given period. As a result, 32 completed responses were received. Based on the pattern of respondents' answers and comments, no amendments were required at this stage.

6.3.3 Result of Final Check

A final check was conducted in the fourth week of March 2016. The final check was performed by distributing the online survey to several postgraduate students at Strathclyde Business School. As a result, the final check confirmed that there was no alteration needed. Therefore, the survey questionnaire was ready to be launched.

6.4 IMPLEMENTATION OF THE SURVEY

The accounting operation of the Malaysian Federal Government is tightly structured. In other words, all accounting divisions need to report to their ministries as well as to the Accountant General's Department (AGD). Each division is led by the Chief Accountant, who is assisted by the Deputy Chief Accountants and accountants. Due to the structure of the Government, this study applied a gatekeeper approach in order to proceed with the data collection. A gatekeeper is defined as an individual who can affect the chance of targeted respondents cooperating with the researcher (Crano et al., 2014). Therefore, it is important to properly approach the gatekeeper in order to gain access to the targeted respondents. Crano et al. (2014) suggested that the researcher should explain the rational of the research and its benefits towards the

targeted group. Calder (1998, p.648) listed several matters to be considered during the data collection process, which are:

i. The fieldwork has to be properly organised in advance.

ii. Gain access to the targeted respondents.

iii. Properly monitor the progress of data collection.

iv. Chasing up the targeted respondents.

v. The quality of the data collection process.

In addition, Dillman (2000, p.151) outlined five multiple contact approaches to increase the survey response rate as follows:

i. Pre-notice letter – An early notification to the respondent a couple of days before sending the questionnaire.

ii. Sending the questionnaire – This includes a cover letter explaining the survey.

iii. Thank you postcard/reminder – This is sent a couple of days to a week after the questionnaire are sent. The purpose is to express appreciation for those who had completed it and as a reminder for those who have not.

iv. Replacement questionnaire – This is sent as a reminder to the recipient to complete the questionnaire and return it. The replacement questionnaire is sent to non-respondents two to four weeks after sending the questionnaire.

v. Final contact – This can be made by telephone a week after the replacement questionnaire is sent.

In the context of this study, the suggestions of Crano et al. (2014), Calder (1998), Dillman (2000) and Bailey and Pearson (1983) are considered and adapted accordingly to suit the Malaysian Federal Government environment. As such, a formal approach was made in the first week of April 2016 to all 24 ministries and the Prime Minister's Department, through the Chief Accountants of each ministry. A formal invitation email was sent to 25 chief accountants, requesting their help with the survey. The survey was expected to be implemented a few days after the invitation. The content of that email mainly explained the purpose of the survey, targeted respondents, method of survey (online based), language used, duration needed to complete and the benefit to the respondent, as well as to the ministry. The email also expressed advance appreciation to the Chief Accountant for his or her kind cooperation. According to Dillman (2000), advance appreciation can make the recipient feel important and respected, thereby encouraging recipients to participate. Besides, the purpose of the invitation email is to build support and trust from the top management in the accounting office of each ministry, as well as the targeted respondents.

Generally, the email was sent to seek for permission and assistance from the chief accountants of each ministry to distribute the questionnaire to all account personnel. In particular, the chief accountants were asked to name an individual as a person in charge for each ministry. A complete list of all ministries, chief accountants, and the nominated person is kept with important details such as date of the first email sent out, the follow up date, a telephone number and an email address, as suggested by Calder (1998). Follow up phone calls were made to the unanswered emails with regards to the first invitation sent to the chief accountants. As a person at

the top management level, the chief accountant is often busy with a tight schedule, as well as a large volume of emails received daily. Therefore, the invitation email might be missed or forgotten. Thus, the purpose of the follow up phone call was to ensure that the chief accountants were aware and informed of the invitation.

Further, the survey link attached with an invitation letter was then emailed to the person in charge a few days after the first invitation email. The person in charge plays a role as a gatekeeper for the respective ministry and assists in forwarding the survey link to all accounting personnel (i.e. AIS users) in the accounting office and the responsibility centre. The purposes of this approach were to avoid multiple survey emails sent to one recipient, to ensure the email is sent to all accounting personnel and to control the possibility of the email being flagged as spam by getting help from internal people with internal email addresses to distribute it.

Technically, this approach is hoped to control sampling error, coverage error and nonresponse error. Sampling error was minimised by ensuring the survey link is sent to all accounting personnel, which gives them a chance to participate. Secondly, coverage error was controlled by allowing all accounting personnel to be sampled in the survey. The gatekeeper (i.e. the person in charge) that assists in forwarding the survey link is more likely to have a complete list of accounting personnel within the ministry. Thus, the possibility of missing some of the potential respondents who are not listed in the directory of the ministry can be minimised. Finally, nonresponse error was controlled by having the survey link to be forwarded to all level of management in the accounting office and the responsibility centre, including the Chief Accountants, Deputy Chief Accountants, accountants, and assistant accountants.

In addition, the invitation letter was written on one page that includes trust-inducing elements such as Strathclyde Business School letterhead, personalised address and researchers' signature, as suggested by Bourque and Fielder (2003) and Dillman (2000). The letter was addressed to all accounting personnel through the Chief of Accountant, which acknowledged not only position but the name of the Chief of Accountant of each ministry to demonstrate that this survey is important and supported by the top management. Moreover, as the survey link was sent to the respective gatekeeper (i.e. the person in charge) suggested by the Chief of Accountant, the survey was more likely to appear important. A survey that seems important may earn the trust of the recipient, encouraging them to participate (Dillman, 2000).

According to Bailey and Pearson (1983), it is helpful to clearly mention in the survey instructions that the survey is assessing current experience instead of past experience. Additionally, to avoid confusion of past experience as well as the upcoming new upgrade on the accounting system, the respondent was instructed to evaluate the current system that mainly related to the Government Financial and Management Accounting System (GFMAS), Electronic Budget Control and Planning System (*eSPKB*) and Standard Collection and Receipting System (*eTerimaan*). Furthermore, as this survey is assessing the system's user's satisfaction towards the AIS of the Government, there is a potential for targeted respondents' to be anxious about participating, thereby stopping them from giving their honest opinion. Thus, following the suggestion by Bailey and Pearson (1983), anonymity of respondents was applied in conducting this survey to encourage participation and honest

opinions. The anonymity matter was clearly explained in the invitation letter as well as on the first page of the questionnaire.

The first follow up email was sent to all gatekeepers to be forwarded to all targeted respondents a week after the distribution of the questionnaire, as suggested by Dillman (2000). The purposes of the email were to give a thank you message for those that contributed in completing the survey and to remind those who have not yet accessed the survey. Thus, a copy of the online survey link was again attached in the email. A second reminder was sent two weeks after the first reminder. The email aimed to remind the targeted respondent that this survey is still active. In addition, an appreciation message was included in the email to thank everyone who had completed the survey. Again, the online survey link was attached to make it easier for the targeted respondents to access the questionnaire without the need to search the previous email that contains the link. On the third week of May 2016, the total number of completed questionnaire responses was 332. Thus, a thank you email was sent to all of the respondents, through the gatekeepers, to show appreciation for their willingness to contribute to this survey. No further reminder was sent. Figure 6.1 illustrates the timeline of the survey fieldwork for this study.

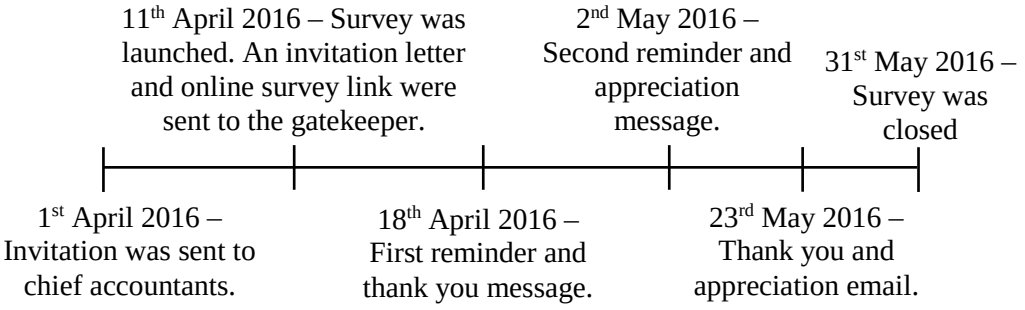

Figure 6.1: The Timeline of Data Collection for Survey

6.5 DATA COLLECTION

Data collection for survey was performed online using the Qualtrics[1] software application. Given the advantages offered by Qualtrics, several functions were applied accordingly to the questionnaire such as mobile friendliness, forced response, save features and continue and back buttons in order to improve the data collection process. Mobile friendliness allows the respondents to view and answer the survey using their mobile phone. Forced response is a function that requires the respondents to answer particular questions that are forced response enabled before they can proceed to the next page. This function is helpful in minimising the missing data problem. Furthermore, save and continue functions offer flexibility to the respondents to partially answer the survey and save their progress. They can return to their partially filled questionnaire at a later time during the data collection period. A back button allows respondents to go back to the previous question and check or change their answer before they finish the survey.

The data collection started on 11th April 2016. It was conducted in about seven consecutive weeks. During the timeline, data collection plan and actual data collected was monitored closely. Follow up phone calls were made to the unanswered email and two reminders were emailed to the nominated gatekeepers to be forwarded to all targeted respondents during the data collection phase.

Table 6.4 shows the progress of survey responses during the period of seven consecutive weeks. During the first week of data collection, a total of 150 completed responses were received. Following the suggestion by Dillman (2000), the first

[1] Qualtrics is a software application for survey questionnaire. The application allows data to be effectively and efficiently collected online and then be downloaded into numerous software packages such as Excel and SPSS.
Source: www.qualtrics.com and www.strath.ac.uk/is/software/qualtrics

reminder was sent together with a thank you message. In the second and third week of the data collection, the completed response increased to more than half of completed responses received previously. The completed responses increased by 98 questionnaires. After that, second reminder was sent together with an appreciation message. The statistic of completed responses increased by approximately one third from the last accumulated number of completed questionnaires. However, it is noted that a total of 17 questionnaires were not completed due to server problems. In total, the response received at the end of week six was 332. The trend of survey responses started to drop from week five. The statistic implies that a majority of the non-response targeted respondents were not interested or not available to participate in this survey. Therefore, no further reminder was sent. On 23rd May 2016, an appreciation message was emailed to all gatekeepers to be forwarded to the targeted respondents. The appreciation message was to thank all respondents for their cooperation and kindness. Nevertheless, the survey was left active until 31st May 2016 to give the opportunity to those who might still wish to participate. The accumulated questionnaires received as of 31st May 2016 was 372. The minimum number expected was 169 completed questionnaires, which represent the minimum sample needed for this study. The expectation of the minimum sample was based on Cohen (1992) for achieving a statistical power of 80% with a minimum R^2 value of 0.10 at a significance level of 1%. Therefore, the 372 questionnaire received are considered sufficient and no further follow up was done. The survey was closed on 31st May 2016.

Table 6.4: The Progress of Survey Response

Week	Date	Description	Accumulated Number of Questionnaire Received	Accumulated Percentage
	11th April 2016	Survey was launched		
1	11th – 17th April 2016	----------	150	40%
	18th April 2016	First reminder and thank you message		
2 – 3	18th April – 2nd May 2016	----------	248	67%
	3rd May 2016	Second reminder and appreciation message		
4 – 6	3rd – 22rd May 2016	----------	332	89%
	23rd May 2016	Appreciation message		
7	23rd – 31th May 2016	----------	372	100%
	31st May 2016	Survey was closed		

6.6 DATA EXAMINATION

Data examination is an important stage that must be performed prior to data analysis (Hair et al., 2017). In the context of this study, the examination of data was conducted to check and treat missing data, suspicious response patterns, outliers and data distribution. However, since the collection of data was conducted online using a helpful Qualtrics software application, there were no major issues noted for missing data and outliers examination.

Missing data in surveys commonly happens when a respondent does not complete the questionnaire. This is not likely to happen in the case of this study because the forced response function was enabled for the survey. Nevertheless, due to technical problems which were mainly caused by the server, a total of 17 datasets

were not completed[2]. The incomplete 17 datasets were removed from the data file as suggested by Hair et al. (2014).

Next, the suspicious response pattern was screened based on the *Perceived Performance* data file. As the questionnaire contained two side-by-side columns (i.e. *Perceived Performance* and *Perceived Importance*), the *Perceived Performance* data file was referred to as the main data. This is because the *Perceived Performance* data file is used for the analysis of the relationship between variables in the proposed research model of this study. Hence, the *Perceived Importance* data file followed the final cleaned datasets of *Perceived Performance*. The screening analysis found 26 responses with a straight lining answer in which the respondents mark the same scale (e.g. score of three or four) for all questions. These datasets were removed from the data file as it indicates a probability that the respondents are simply marking their answer. Furthermore, two responses were identified as non-accounting staff based on their grade position. Thus, they were removed from the data file. The final number of datasets used in this study was 327. Table 6.5 shows the datasets in detail.

Table 6.5: Final Datasets Breakdown

Description	Number of Dataset
Total number of questionnaire received	372
Incomplete questionnaire	17
Suspicious response pattern (i.e. straight lining answer)	26
Non-targeted respondent	2
Usable questionnaire for data analysis	**327**

[2] As stated by a respondent in an email, the survey was stopped and closed automatically without notice while he was answering. This issue had been forwarded to Qualtrics expert team for further investigation and the problem was resolved during the day. As informed by the Qualtrics expert team member, the problem has no impact on the collected data and thus, no further action was taken.

Further, the data was then screened for outliers. An outlier is an extreme data or value in the data file (Tabachnick and Fidell, 2007). In the context of the survey questionnaire method, 'outliers can result from data collection of entry errors' (Hair et al., 2017, p. 59). For example, accidently entered "6" instead of "5", for a manual coding, on a five-point Likert-scale. As the data collection was conducted through an online survey, in which the data was downloaded from the online survey application, this problem is unlikely to occur. The screening performed found no out-of-range values in the data file.

After that, a normality test was conducted to see the distribution of the data. Partial Least Squares Structural Equation Model (PLS-SEM) does not require normality in the distribution of data because it is non-parametric statistical method. However, Ringle et al. (2012) and Hair et al. (2017) suggested checking and verifying the data distribution to ensure that it is not too far from normal distribution. Hair et al. (2017, p. 61) added, 'extremely nonnormal data prove problematic in the assessment of parameters' significances … [in a way that it] inflate standard errors obtained from bootstrapping and thus decrease the likelihood that some relationship will be assessed as significant'. Normality of data distribution in this study was assessed based on skewness and kurtosis value. Skewness refers to distribution symmetry of data and kurtosis assesses the peak of data distribution (Tabachnick and Fidel, 2007; Hair et al., 2014). The distribution of data is normal at the value of skewness and kurtosis equivalent to zero (Tabachnick and Fidell, 2007). Skewness and Kurtosis values above positive or negative one (+/-1) are considered non-normal distribution (Hair et al., 2014). The test was performed on all 43 indicator items in the research model of this study using IBM SPSS Statistics 23 software application.

The result found the skewness values ranged from -0.955 to 0.342 except for two items, and the kurtosis values ranged from -0.517 to 0.738 except for eight items. The items with skewness or kurtosis values of more than positive or negative one (+/-1) are presented in Table 6.6.

Table 6.6: The Items with Skewness or Kurtosis Value Above Positive or Negative One (+/-1)

Item	Description	Value
		Skewness
AESQ1	The system is easy to use (user friendly).	-1.085
AESQ2	The processing time (i.e. speed) of the system.	-1.077
		Kurtosis
AESQ1	The system is easy to use (user friendly).	3.739
AESQ2	The processing time (i.e. speed) of the system.	2.516
AEIQ1	The information is accurate (no doubt).	3.173
AEIQ2	The information is complete (all transactions are captured accordingly).	3.357
AEIQ3	The information is relevant for use in decision-making.	2.833
AEBU1	The system improves individual productivity.	2.161
AEBU2	The system improves the decision-making process.	1.945
AEBU3	The system minimises unintentional human error.	1.700

Non-normal distribution is quite common in social science research that involves a large sample size (Pallant, 2007). According to Tabachnick and Fidell (2007, p. 80), 'if the sample is large, it is a good idea to look at the shape of the distribution instead of using formal inference tests'. Thus, the visual shape of distribution was assessed accordingly as shown in Figure 6.2. Referring to the histograms, none of the items extremely deviate from the normality distribution. Hence, the items (i.e. AESQ1, AESQ2, AEIQ1, AEIQ2, AEIQ3, AEBU1, AEBU2 and AEBU3) are retained.

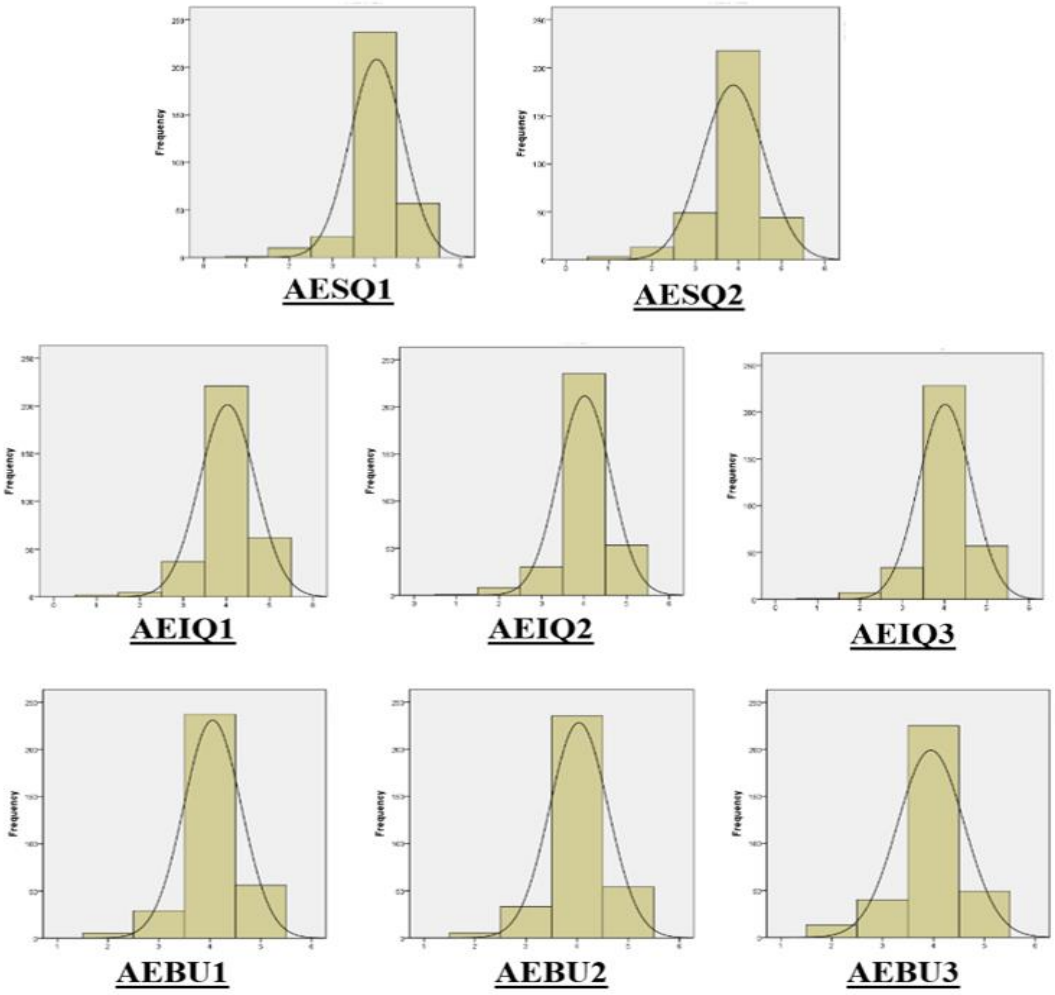

Figure 6.2: The Histogram of Data Distribution

6.7 DESCRIPTIVE ANALYSIS FOR THE SURVEY

6.7.1 Demographic Profile of Respondents

i. Age, Education Level, Working Experience and Grade of Employment

Based on the survey, more than half of the respondents were aged between 31 to 40 years old. This is consistent with the position structure in the Government, in which most of the executive, executive assistant and lower positions are held by employees within this age range. These positions are the most involved with the groundwork

(e.g. daily transactions) in the accounting process. The statistics suggest a good representation in the dataset of this study.

Specifically, most of the respondents in the group aged 31 to 40 years old have a bachelor's degree followed by a diploma/*STPM* (i.e. equivalent to A-Level). These levels of education are commonly held by account executive positions and assistant executive positions. This statistic is supported by the proportion of top management level (i.e. grade W48 to W52) is 13.8%, executive level (i.e. Grade W41 to W44) about 20.5% and the executive assistant and below is approximately 56.9%, while the remaining 8.9% did not state their job position. In addition, almost half of the respondents have work experience of about six to 10 years in the government sector, which represents 42.8% of the total respondents. Figure 6.3 illustrates the proportion of age and education level of the respondents and Table 6.7 shows the details of respondents' employment grade and working experience in the government sector.

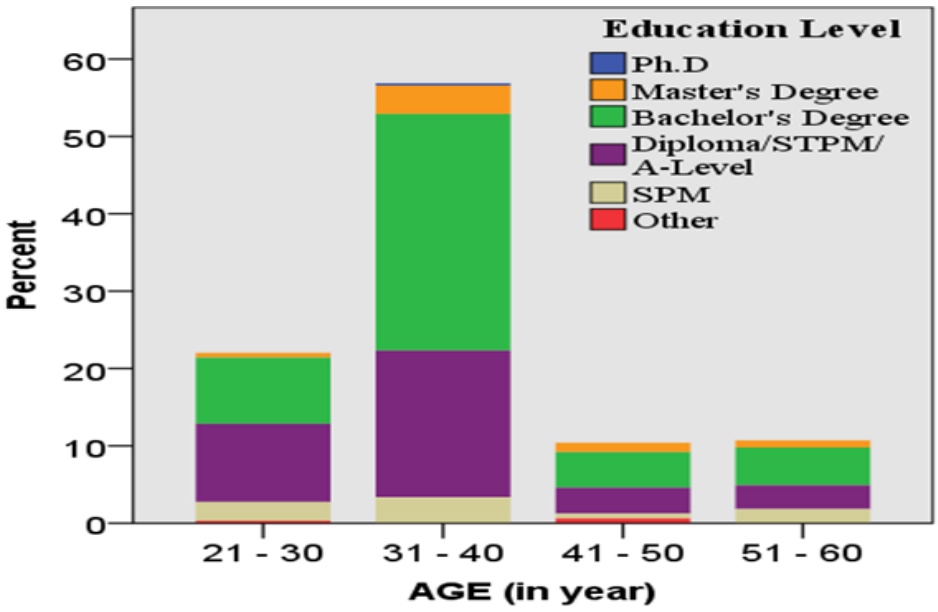

Figure 6.3: The Proportion of Age and Education Level of the Respondents

Table 6.7: The Details of the Respondents' Employment Grade and Working Experience in the Government Sector

Description	Percentage (%)
The Respondents' Employment Grade (grade range);	
W17 - W27	44.3
W32 - W36	12.5
W41 - W44	20.5
W48 - W52	13.8
Unspecified	8.9
Total	100
Working Experience (in year) in the Government Sector;	
Less than one year	2.1
One to five years	17.7
Six to 10 years	42.8
More than 10 years	37.3
Total	100

ii. Gender

According to the descriptive statistics, females (i.e. 76.5%) respondents were three times more numeric than male (i.e. 23.5%) respondents. This is because women are more likely to hold accounting positions in the Malaysian Federal Government. Figure 6.4 shows the proportion of male and female respondents for the quantitative part of this study.

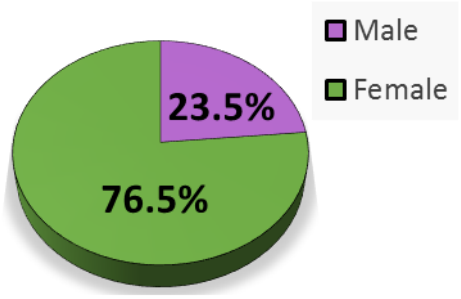

Figure 6.4: The Proportion of Respondents based on Gender

The statistic is consistent with gender population statistics based on the data obtained from the 24 ministries' and the Prime Minister's Department's websites. The ministries' websites show approximately 75% of the employees in the accounting office are female. The gender population statistic excludes responsibility centres as the centres do not have their own specific website and it is difficult to gather such information. Additionally, this gender proportion is similar to prior studies on the Malaysian public sector, such as Atan and Mohamed Yahya (2015), Isa et al. (2014) and Ilias and Zainuddin (2013).

Further investigation shows the finding is consistent with public sector statistic reports as at 31st December 2014. The statistic reported that approximately 56% of professional, management and support staffs in the Malaysian public sector are female (Statistics on Women, Family and Community Malaysia 2014). Furthermore, in terms of education, a statistic for 2013 shows approximately 60% of university students in the social science field are female. Therefore, it is not surprising to see the employee's proportion in the accounting field where female is higher than male for the Malaysian Federal Government. Nonetheless, overall gender population of civil servants in Malaysia is almost equal between man and women but top management positions are primarily held by men; approximately 62.9% (*Wanita* 2014 – 2016, *Kementerian Pembangunan Wanita, Keluarga dan Masyarakat*). Overall, the proportion of gender in this study suggests good representation in the dataset.

iii. Qualification of Educational Background and Membership of Professional Body

Almost all of the respondents (approximately 95.7%) are members of the Malaysian Institute of Accountants (MIA). Some of them are also members of other professional bodies such as the Association of Chartered Certified Accountants (ACCA), the Chartered Institute of Management Accountants (CIMA) and the Chartered Institute of Public Finance and Accountancy (CIPFA). However, in terms of their qualification of educational background, about 26.3% of the respondents have mixed accounting and other qualification background (e.g. bachelor's degree in accounting and master's degree in human resource) and 9.2% of the respondents have a non-accounting qualification background. Nevertheless, the majority of the respondents (i.e. 64.5%) have an education qualification solely in accounting. Table 6.8 shows the details of the respondents' qualification of education background and membership of professional bodies.

Table 6.8: The Respondents' Qualification of Educational Background and a Membership of Professional Body

Description	Percentage (%)
The Qualification of Educational Background;	
- Solely in accounting field	64.5
- Mixed accounting and other fields (e.g. business admin, marketing etc.)	26.3
- Non-accounting field	9.2
Total	100
Membership with any Professional Body;	
- A member of Professional body	4.3
- Not a member of professional body	95.7
Total	100

iv. Background of Department and Experience of AIS Software

Approximately 62.1% of the respondents are from the accounting office in which about half of them are newly appointed Self Accounting Department (SAD) (34.1%). Newly appointed SAD means a new accounting office established since 2013. On the other hand, responsibility centres contributed about 37.9% to the total respondents. This statistic is consistent with the users that have experience in AIS related application software (i.e. GFMAS – 63.9%). The GFMAS is mostly accessible by the users at the accounting office. Furthermore, 87.2% of the total respondents have experience using *eSPKB* and 65.1% have experience using *eTerimaan*. The *eSPKB* and *eTerimaan* are accessible at both the accounting office and the responsibility centre. Figure 6.5 illustrates the percentage of the respondents that have experience in using GFMAS, *eSPKB* and *eTerimaan*, which are proportioned according to the background of the department.

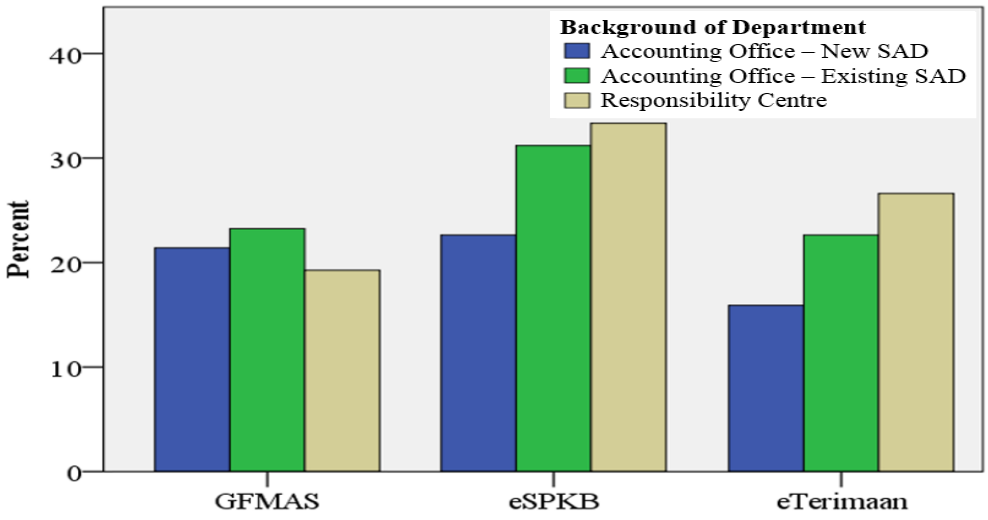

Figure 6.5: The Proportion of Respondents based on their Experience in AIS-related Applications Software Categorised According to the Background of Department

6.7.2 Descriptive Statistics of the Variables' Measurement Items

As referred to in the descriptive statistics of the measurement items' score for *AIS effectiveness*, on average, the AIS users are satisfied with the system quality, information quality and benefit/usefulness of AIS. The finding suggests the present AIS is effective. On the other hand, the items that represent the critical factors and its determinants scored slightly above three on averages. It indicates a good performance for each of the measured items. Table 6.9 shows the descriptive statistics of the measurement items.

6.7.3 Other Opinions from the Respondents

The questionnaire for this study was also designed to have an extra space for the respondents to share their additional comments or opinions. Some of the respondents wrote "good", "no comment" and "thank you" in the provided space. However, more interesting comments included a suggestion about proper planning towards any upcoming systems. In addition, there are also comments about the need for an easier and faster system, as well as more training for better understanding of the system functions. Furthermore, one of the respondents mentioned the capability of the AIS in providing a function of single entry record makes the system easier to be used by anyone, including non-accounting personnel. However, another respondent believes that there is a need to have accounting personnel with accounting qualification of education background. There should be at least one at every responsibility centre to avoid misunderstanding and miscommunication about any issues related to accounting matters.

Table 6.9: Descriptive Statistics of the Measurement Items

Variable	Items	Mean	Median	Mode
1) AIS Effectiveness	User satisfaction is scaled from ***very dissatisfied*** to ***very satisfied***			
i. System Quality	- Ease of use (user friendly).	4.04	4	4
	- Processing time (i.e. speed).	3.88	4	4
	- Ability to produce report in a required format.	3.84	4	4
ii. Information Quality	- Accurate (no doubt).	4.03	4	4
	- Completeness (all transactions are captured accordingly).	4.01	4	4
	- Relevant for use in decision making.	4.02	4	4
iii. Benefit/usefulness of AIS	- Improved individual productivity.	4.05	4	4
	- Improved decision-making.	4.03	4	4
	- Minimised unintentional human error.	3.95	4	4
	- Reduced hard copy submissions (paperless).	3.69	4	4
	Perceived performance is scaled from ***poor*** to ***excellent***			
2) User Commitment	- Compliance with SOP and related regulations.	3.49	3	3
	- Prioritise the use of AIS.	3.43	3	3
	- Actively involved in the decision-making process	3.43	3	3
3) Technology Support Function	- Up-to-date hardware and software.	3.31	3	3
	- Strong data protection technology and back-up.	3.38	3	3
	- Integration between systems in the Government.	3.31	3	3
4) Knowledge	- Understanding of the accounting standards.	3.38	3	3
	- Academic qualification in accounting or finance (with basic accounting).	3.53	3	3
	- Experience in accounting and AIS.	3.43	3	3
	- Understanding of the function and process in AIS.	3.35	3	3

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Variable	Items	Mean	Median	Mode
		Perceived performance is scaled from ***poor*** to ***excellent***		
5) Top Management Support	- Encourage employees to attend training.	3.35	3	3
	- Appreciation and utilisation of the information produced by AIS.	3.32	3	3
	- Encourage the improvement of AIS.	3.35	3	3
6) Culture	- Appreciative and supportive environment towards technology enhancement.	3.39	3	3
	- Open door policy.	3.40	3	3
	- Transfer of knowledge (i.e. internal expert to AIS users).	3.36	3	3
7) Internal Expert	- IT department provides adequate technical support.	3.36	3	3
	- IT department gives prompt feedback.	3.32	3	3
	- The headquarters provides adequate technical support	3.40	3	3
	- The personnel at the headquarters are experienced.	3.45	3	3
8) External Expert	- Vendor/consultant provides adequate technical support.	3.25	3	3
	- Vendor/consultant clearly understands the organisation's requirements.	3.21	3	3
	- Vendor/consultant is experienced.	3.22	3	3
9) Monitoring and Review	- System comparison with other developing countries.	3.15	3	3
	- System comparison with developed countries.	3.17	3	3
	- Inspection (*naziran*) of documentation and procedure.	3.57	3	3
	- System audit (system check).	3.46	3	3
	- Periodic review on the manual guideline and SOP.	3.41	3	3
10) Teamwork	- Effective communication between levels of management.	3.34	3	3
	- AIS users actively share useful information among employees (but consider confidentiality).	3.37	3	3
	- Good relationship between AIS users in the accounting office.	3.49	3	3
	- Good relationship between accounting office and other departments within the organisation.	3.46	3	3
	- High cooperation among AIS users within the Government.	3.43	3	3

Another comment mentioned the importance of the AIS enhancement in order to provide reliable and useful information for a more productive decision-making process. The respondent also mentioned the importance of communication between subordinates. Additionally, some of the respondents stated the importance of having a system that is capable of generating reports according to the required types of file (e.g. excel or pdf).

Specifically mentioned about top management and vendor, one of the respondents stated that a commitment and communication from a high level of management to lower level of management is crucial for the system's success. On the other hand, the vendor should understand the Government environment, systems and needs in order to design a good system that can provide reports as required. Another respondent stated that communication and transfer of knowledge from the expert to the system users leads to improvement in users' capability to effectively use the system.

Another key point shared by the respondent is about the upcoming AIS software that is going to be implemented in the near future. The upgrading of the current AIS software is aimed to support the transition from cash basis to accrual-based accounting treatment. It is also mentioned that the current AIS is very good at enhancing the accounting process (e.g. payment is processed faster when compared to the previous system).

6.8 DATA ANALYSIS AND FINDINGS

The quantitative data of this study was statistically analysed using Partial Least Squares Structural Equation Model (PLS-SEM) in order to develop a comprehensive

measurement for AIS effectiveness and examine the relationship between the proposed variables in the research model. The Hierarchical Components Model (HCM) analysis was applied to test the reliability and validity of the AIS effectiveness measurement. In addition, the Importance-Performance Analysis (IPA) matrix was used to descriptively evaluate the gap between perceived importance and perceived performance of all identified factors in the research model.

6.8.1 The Research Model and Its Measurements

The research model of this study is illustrated into: (i) Main research model; (ii) Final research model. The main research model proposed in this study comprises of 38 indicator items that are used to measure 11 variables, not including the moderator variable. The 11 variables compose of six exogenous variables (i.e. independent variables) and five endogenous variables[3]. AIS effectiveness is represented by three dimensions that are treated as three separate dependent variables in the main research model. The dimensions of AIS effectiveness are further combined using the HCM approach to form a dependent variable of *AIS effectiveness* in the final research model. The final research model consists of 10 variables, including an addition of a moderator. The codes of variables used in analysing the research model are shown in Table 6.10.

Before the data analysis is started, one is recommended to check the algorithm converges. This was performed by checking the maximum number of iterations. Hair et al. (2017, 2014) stated that if the PLS-SEM does not converge below the maximum number of iterations set in the software application (i.e. the

[3] Endogenous variables are the variables that 'serve only as dependent variable .. or as both independent and dependent variable' (Hair et al., 2014, p. 14).

default setting is 300), the algorithm is unable to find a stable solution. Concerning the result of the PLS algorithm, the algorithm of the data of this study converged after iteration five suggesting that the PLS path model estimation was ready for analysis.

Table 6.10: The Code of Variables

Variable	Code	Items
1) AIS Effectiveness		
System Quality	AESQ1	- Ease of use (user friendly).
	AESQ2	- Processing time (i.e. speed).
	AESQ3	- Ability to produce report in a required format.
Information Quality	AEIQ1	- Accurate (no doubt).
	AEIQ2	- Completeness (all transactions are captured accordingly).
	AEIQ3	- Relevant for use in decision-making.
Benefit/ usefulness of AIS	AEBU1	- Improved individual productivity.
	AEBU2	- Improved decision-making process.
	AEBU3	- Minimised unintentional human error.
	AEBU4	- Reduced hard copy submissions (paperless).
2) User Commitment	UC1	- Compliance with SOP and related regulations.
	UC2	- Prioritise the use of AIS.
	UC3	- Actively involved in the decision-making process
3) Technology Support Function	TSF1	- Up-to-date hardware and software.
	TSF2	- Strong data protection technology and back-up.
	TSF3	- Integration between systems in the Government.
4) Knowledge	KN1	- Understanding of the accounting standards.
	KN2	- Academic qualification in accounting or finance (with basic accounting).
	KN3	- Experience in accounting and AIS.
	KN4	- Understand of the function and process in AIS.
5) Top Management Support	TM1	- Encourage employees to attend training.
	TM2	- Appreciation and utilisation of the information produced by AIS.
	TM3	- Encourage the improvement of AIS.
6) Culture	CUL1	- Appreciative and supportive environment towards technology enhancement.
	CUL2	- Open door policy.
	CUL3	- Transfer of knowledge (i.e. internal expert to AIS users).
7) Internal Expert	INE1	- IT department provides adequate technical support.
	INE2	- IT department gives prompt feedback.
	INE3	- The headquarters provides adequate technical support
	INE4	- The personnel at the headquarters are experienced.

Continue…

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Variable	Code	Items
8) External Expert	EXE1	- Vendor/consultant provides adequate technical support.
	EXE2	- Vendor/consultant is clearly understand the organisation's requirement.
	EXE3	- Vendor/consultant is experienced.
9) Monitoring and Review	MR1	- System comparison with other developing countries.
	MR2	- System comparison with developed countries.
	MR3	- Inspection (*naziran*) of documentation and procedure.
	MR4	- System audit (system check).
	MR5	- Periodic review on the manual guideline and SOP.
10) Teamwork	TW1	- Effective communication between levels of management.
	TW2	- AIS users actively share useful information among employees (by considering confidentiality).
	TW3	- Good relationship between AIS users in the accounting office.
	TW4	- Good relationship between accounting office and other departments within the organisation.
	TW5	- High cooperation among AIS users within the Government.
11) Organisation Size		- Small ministry = 1; Large ministry = 2.
12) Background of Department		- Accounting office = 1; Responsibility centre = 2.
13) Qualification of Educational Background		- Solely in accounting filed = 1; Mixed (i.e. accounting field and other fields) or Non-accounting field = 2.
14) Education Level		- Bachelor's degree or higher = 1; - Diploma or lower = 2.

The analysis of data in this study started with the measurement model evaluation based on the examined and cleaned data as explained previously in section 6.6, page 258 in this chapter. Evaluation of the measurement model aims to ensure the reliability and validity of the indicator items and its particular construct (i.e. the variables) in the path model. Once the reliability and validity of the measurement model has been established, the model is ready for structural model evaluation. The structural model evaluation intends to examine the relationships between variables.

6.8.2 Measurement Model Evaluation

The objective of measurement model evaluation is to test the reliability and validity of the measurement items and its variable. If necessary, treatment of the respective items or construct will be performed to ensure that the measurement model is reliable and valid for further evaluation. The measurement model of this study is reflective-based. A reflective-based measure 'represents the effects (or manifestations) of an underlying construct' (Hair et al. 2014, p. 43). 'With reflective (or effect) measurement models, causality flows from the latent construct to the indicator' (Coltman et al., 2008, p. 1). The items in reflective measurement model are highly correlated with each other's within its particular construct (Hair et al., 2014; Coltman et al., 2008) in which representing a phenomenon of the construct. As such, changing or removing any of the items from its particular construct will not change the nature of the construct (Hair et al., 2014; Hair et al., 2011). There are three main concerns in evaluating a measurement model: convergent validity; internal consistency reliability; and discriminant validity. The tests are performed simultaneously, by calculating the PLS Algorithm for all variables in the research model. The result of measurement model evaluation (i.e. reliability and validity) is presented following the PLS report writing best practice as suggested by Hair et al. (2017), Henseler et al. (2015), Wong (2013) and Chin (2010).

i. Convergent Validity

Convergent validity is 'the extent to which a measure correlates positively with alternative measures of the same construct' (Hair et al., 2014, p. 102). Evaluation of convergent validity is performed by checking the outer loadings and the Average

Variance Extracted (AVE) values. An established rule of thumb is that the standardised outer loadings for each item should be higher than 0.708. A value of 0.70 is commonly accepted as a sufficient level of indicator item reliability (Hair et al., 2014; Hulland, 1999). However, Birkinshaw et al. (1995) suggested that any items with outer loadings above 0.60 should be retained. On the other hand, the AVE values of each construct that is higher than 0.5 demonstrates the convergent validity of the construct.

The evaluation of measurement model in this study found the outer loadings for all items are above the threshold of 0.708, with a minimum value of 0.720. Furthermore, the result reported that the AVE values of each construct to be higher than 0.5, with a minimum of 0.651 and a maximum value of 0.913. The results indicate that the convergent values for all constructs in the path model are demonstrated accordingly. See Appendix G for the PLS algorithm report about the AVE values.

ii. Internal Consistency Reliability

Internal consistency reliability is a test to examine the reliability of items in representing its particular construct. Conventionally, researchers refer to Cronbach's alpha value to examine the internal consistency reliability. A threshold of 0.7 for Cronbach's alpha value, proposed by Nunnally (1978), is generally accepted among researchers. However, 'Cronbach's alpha is sensitive to the number of items in the scale' (Hair et al., 2017, p. 111). Alternatively, researchers can refer to a composite reliability value. Similar to Cronbach's alpha, a composite reliability value of more than 0.7 indicates a sufficient level of internal consistency reliability. Nevertheless,

both measures have their limitations. While Cronbach's alpha 'tends to underestimate the internal consistency reliability[,] … composite reliability tends to overestimate the internal consistency reliability' (Hair et al., 2017, p. 111 and 112). Hence, Hair et al. (2017) advised researchers to report both values.

Based on the PLS algorithm result of this study, it is reported that the Cronbach's alpha and composite reliability values for all constructs are well above the minimum level of 0.7. The minimum value for Cronbach's alpha and composite reliability is 0.776 and 0.869, respectively. The result implies the internal consistency reliability for all constructs in the research model. The PLS algorithm result for Cronbach's alpha and composite reliability values can be found in Appendix G, presented together with the AVE values.

iii. Discriminant Validity

Discriminant validity indicates that a construct represents a phenomenon not captured by other constructs in the research model (Hair et al., 2017). Discriminant validity can be measured by examining cross-loadings of all indicators and Fornell-Larcker criterion. In cross-loadings analysis, the outer loading of each indicator should be greater on its associated construct than any of its cross-loadings on other constructs (Hair et al., 2014). On the other hand, the Fornell-Larcker analysis concerns the square root of AVE values, in which the values of each construct 'should be greater than its highest correlation with any other construct' (Hair et al., 2014, p. 105). Recent research by Henseler et al. (2015, p. 116) found 'neither the Fornell-Larcker criterion nor the assessment of the cross-loadings allows users of variance-based SEM[, such as PLS,] to determine the discriminant validity of their

measures'. The cross-loadings and Fornell-Larcker criterion are said to poorly detect the lack of discriminant validity under certain circumstances (e.g. low sample size, homogenous loading patterns) (Hair et al., 2017; Henseler et al., 2015). Therefore, Henseler et al. (2015) proposed the Heterotrait-Monotrait Ratio (HTMT) approach to examine the discriminant validity in variance-based SEM, including that a PLS. HTMT value below 0.9 indicates the establishment of discriminant validity (Hair et al., 2017; Henseler et al., 2015). However, a HTMT value close to 1.0, but not perfectly correlated, may not necessary indicate a lack of discriminant validity if 'the loading are homogenous and high or .. the sample size is large' (Henseler et al., 2015, p. 128). In addition, Hair et al. (2017) suggested to statistically test the discriminant validity by assessing the confidence interval (bias corrected) 'whether the HTMT values are significantly different from 1' (Hair et al., 2017, p. 130).

As a result for this study, the cross-loadings provide initial support for the constructs' discriminant validity. Each indicator item loads highest on its particular construct. In addition, the Fornell-Larcker criterion reported that the square roots of AVE values for each construct are higher than its correlations with any other constructs. The result exhibits discriminant validity of all constructs. Alternatively, the HTMT result found three values that are correlated above 0.9, indicating the lack of discriminant validity, which are the correlations between: *Monitoring and Review* and *Culture* (0.901); *User Commitment* and *Knowledge* (0.949); and *Top Management Support* and *Teamwork* (0.930). The lack of discriminant validity for *User Commitment* and *Knowledge*, and *Top Management Support* and *Teamwork* were treated by eliminating *KN1* (i.e. in *Knowledge* variable) and *TW2* (i.e. in *Teamwork* variable) from the research model.

After eliminating some of the items from the research model, the PLS algorithm was run again. It was found that all correlations were well below the threshold of 0.9, with a maximum value of 0.892, except for the correlation between *Monitoring and Review* and *Culture* which had a HTMT value of 0.901. There were no changes made to either constructs as the HTMT value is just slightly above the threshold of 0.9. As some of the items were developed from the qualitative findings of this study, all items in both constructs (i.e. *Monitoring and Review* and *Culture*) were retained. Besides, the loading patterns for both constructs are homogenous and the sample size is large (i.e. 327). Additionally, the convergent validity and the internal consistency reliability for the affected constructs were assessed again. This is to ensure the changes made did not significantly affect the convergent validity and internal consistency reliability of the constructs and its related indicator items. Further testing on HTMT values by assessing the confidence interval at 95% (bias-corrected and accelerated) suggests the HTMT values are significantly different from one. Based on the results from cross-loadings, Fornell-Larcker criterion and HTMT, it can be concluded that the discriminant validity of all constructs in the research model has been well established. The result reports are shown in Appendix H, Appendix I and Appendix J. Overall, the reliability and validity of the measurement model is satisfactorily exhibited. The research model is now ready for structural model evaluation.

6.8.3 Structural Model Evaluation

Structural model evaluation focuses on the predictive capability of the model and the correlations between variables. PLS-SEM aims to maximise the explained variance

of all endogenous variables in a path model (Hair et al. 2017, 2014; Reinartz et al., 2009). Therefore, the assessment of model fit in CB-SEM is not suitable for application in PLS-SEM. Rather, the model is assessed based on it predictive capabilities. Moreover, the assessment of model fit in PLS-SEM is still in an early stage of development (Hair et al., 2017).

PLS-SEM presumes non-normal distribution of data. Therefore, a bootstrapping procedure is applied in examining the relationships between variables. A bootstrapping procedure 'involves repeated random sampling with replacement from the original sample to create a bootstrap sample' (Hair et al., 2011). The procedure performs simultaneous calculations for all relationships in the research model.

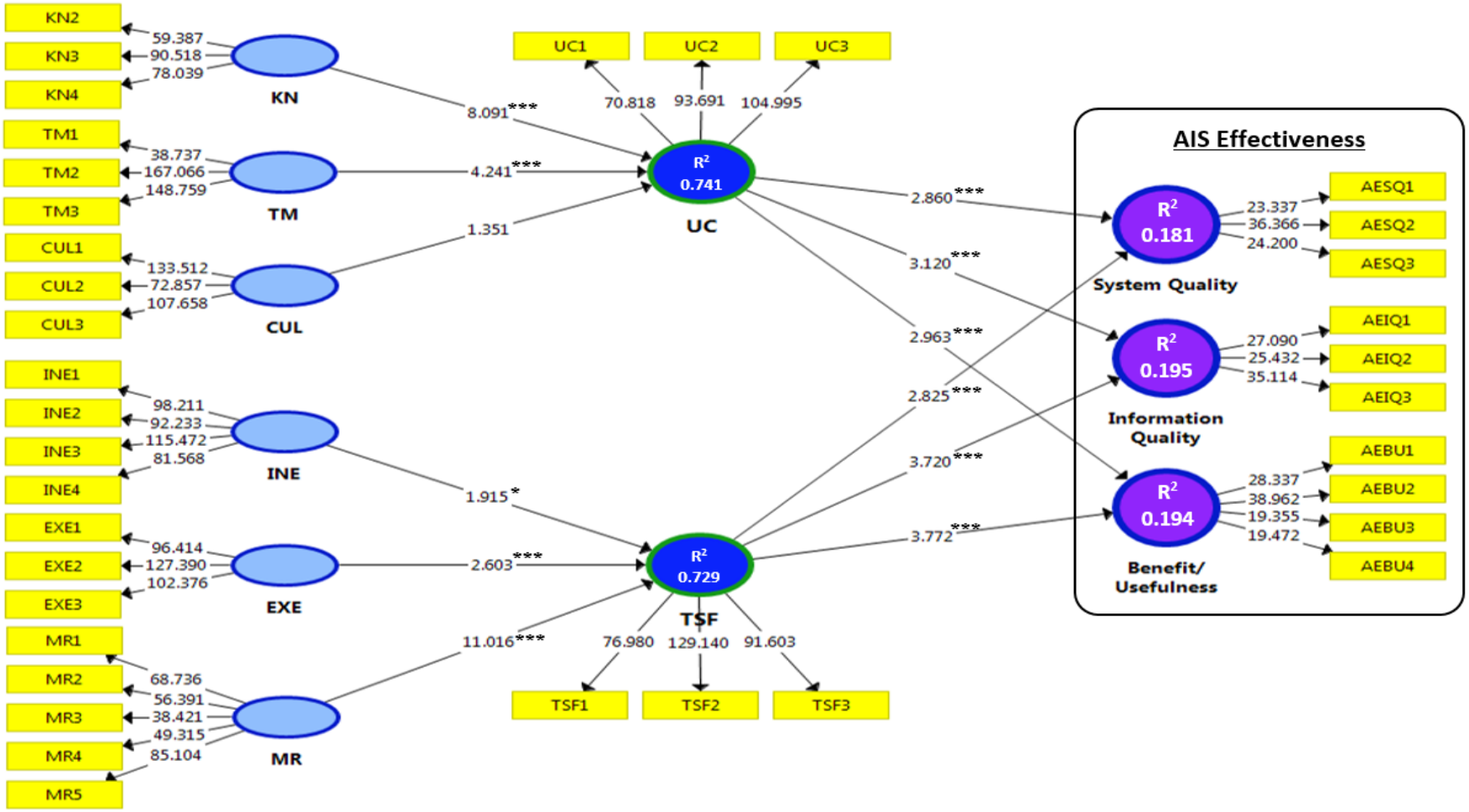
The research model in this study was examined in three stages. First, the main research model assesses AIS effectiveness using three dependent variables that are represented by its dimensions (i.e. system quality, information quality and the benefit/usefulness of AIS). Second, a final research model using HCM analysis that demonstrates the combination of the three dimensions into one dependent variable, which is AIS effectiveness variable. Third, the final research model incorporates a moderator. A complete bootstrapping of 5,000 subsamples, applying Bias-Corrected and Accelerated (BCa) bootstrap confidence interval method, with a two-tailed test at a significance level of 10% was applied to calculate both models, the main research model and the final research model. The use of 5,000 bootstrap samples and BCa confidence interval method are recommended by Hair et al. (2017). In particular, BCa is suitable for a complex path model and a large sample size (i.e. more than 300 samples). Thus, it is appropriate to be applied in the analysis of this study. The

findings in this section are explained in the following subsections. Visually, the bootstrapping result for the main research model is illustrated in Figure 6.6. On the other hand, the bootstrapping result for the final research model applying the HCM analysis is shown in Figure 6.7 and incorporates a moderator in Figure 6.8. The result of the PLS algorithm for all research models are attached in the appendices. See Appendix K, Appendix L and Appendix M.

i. Collinearity

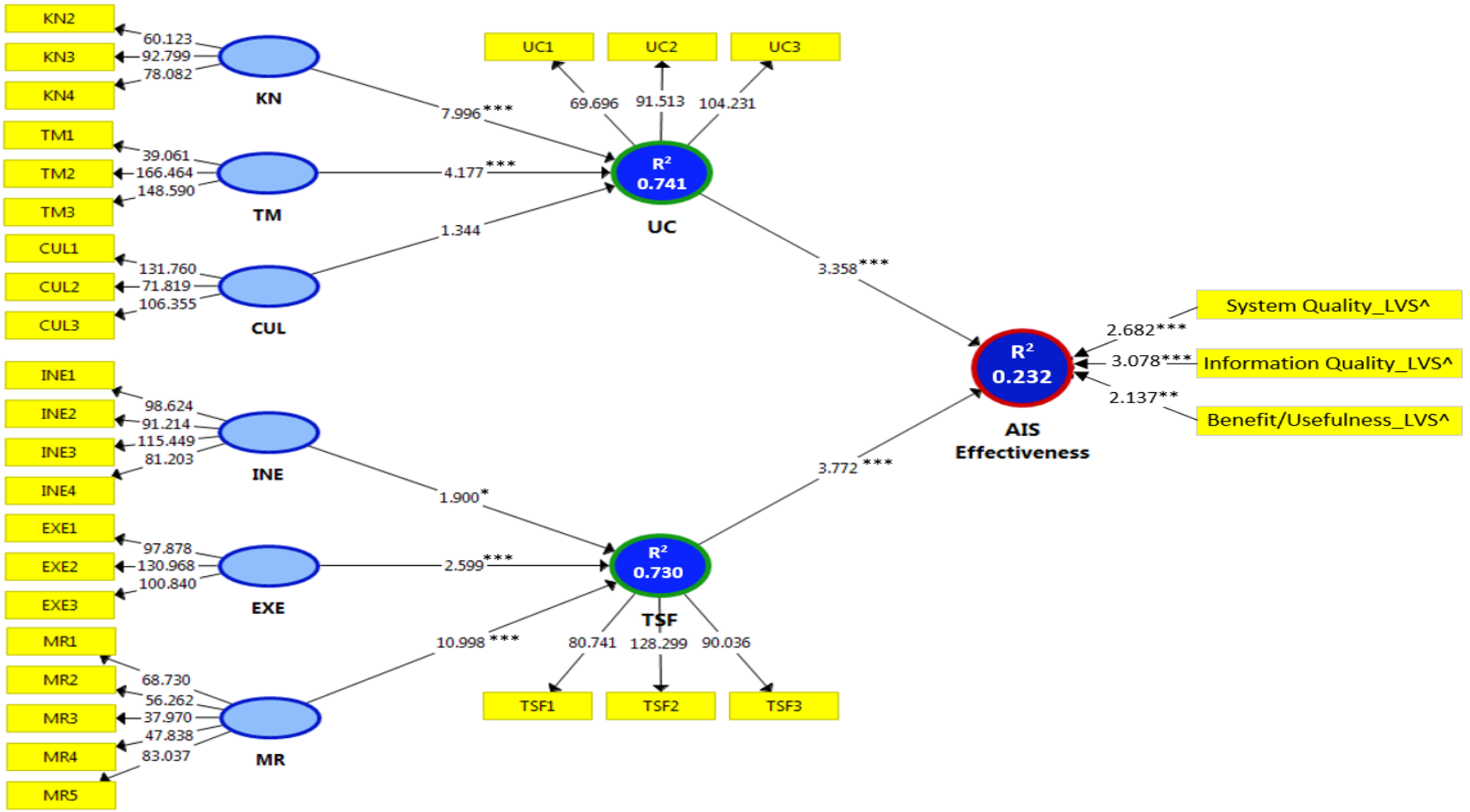
Collinearity refers to a high correlation between two or more independent variables in each subpart represented by the dependent variables in a research model. There are several ways to examine the collinearity issue. Among all the approaches, assessing the Variance Inflation Factor (VIF) value has become common practice, especially in PLS-SEM (Hair et al., 2017). A general rule of thumb for the upper value of VIF is five. A VIF value higher than five indicates a critical collinearity issue (Hair et al., 2017). The assessment of collinearity in this study was conducted separately for each subpart (i.e. *User Commitment*, *Technology Support Function* and the dimensions in *AIS effectiveness*) of the endogenous variables in the research model, as suggested by Hair et al. (2017).

Based on the results of the PLS algorithm, all exogenous variables (i.e. independent variables) for each subpart model in both the main research model and the final research model, have VIF values below five. The results suggest that the collinearity issue among the variables in the research models is below the critical level. The VIF values for each subpart in the research models can be viewed in the Appendix N. Thus, the research models can now proceed for further evaluation.



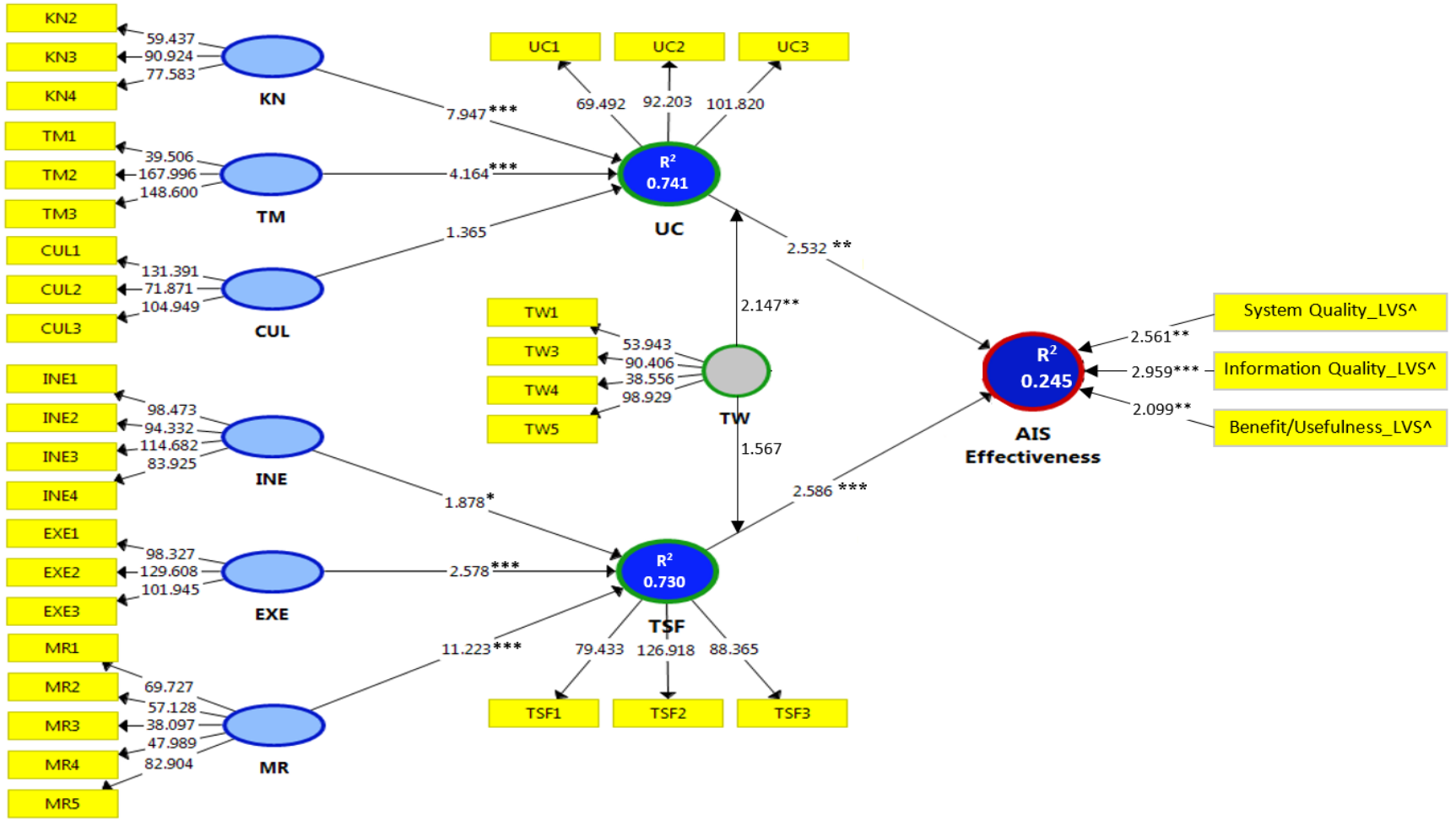
***p < 1%, **p < 5%, *p < 10%

Figure 6.6: Bootstrapping Result of the Main Research Model (t-values)



***p < 1%, **p < 5%, *p < 10%; ^Latent Variable Scores

Figure 6.7: Bootstrapping Result of the Final Research Model Applying HCM Second-Stage Analysis (t-values)



***p < 1%, **p < 5%, *p < 10%; ^Latent Variable Scores

Figure 6.8: Bootstrapping Result of the Final Research Model Applying HCM Second-Stage Analysis with a Moderator (*t*-values)

ii. AIS Effectiveness Measurement

The Main Research Model – AIS Effectiveness Dimensions

AIS effectiveness is measured based on user satisfaction towards the criteria of an effective system. The criteria are grouped into three dimensions: system quality; information quality; and the benefit/usefulness of the system. In total, there are 10 indicator items (i.e. the system criteria) representing the three dimensions. Each dimension has, on average, three to four indicator items. Concerning measurement model analysis, all indicator items are found to significantly represent each dimension in the AIS effectiveness. Generally, the 10 indicator items load similar to each other's, with outer loadings values ranged from 0.720 to 0.874. In particular, system quality is highly represented by AESQ2 (i.e. processing time - speed), whereas information quality is greatly represented by AEIQ2 (i.e. completeness) and followed closely by AEIQ1 (i.e. accuracy). On the other hand, the benefit/usefulness dimension is highly represented by AEBU2 (i.e. improved decision-making). The extraction results from the main research model for the outer loadings of AIS effectiveness dimensions' criteria are illustrated in Figure 6.9.

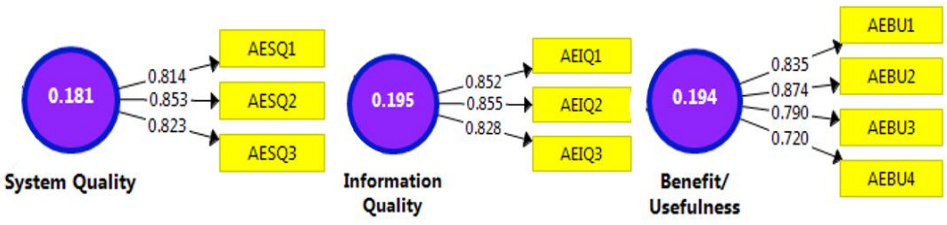


Figure 6.9: Extraction Results for Outer Loadings Values of AIS Effectiveness Dimensions' Criteria in the Main Research Model

There are several measures of AIS effectiveness in the literature. Therefore, this study intends to comprehensively combine the existent measures with the

qualitative findings of this study to create an inclusive measurement of AIS effectiveness. As such, a HCM approach was used to statistically develop and test the measurement of the AIS effectiveness, on top of theoretical support and the conceptual definition of system effectiveness.

The Final Research Model - Hierarchical Components Model (HCM)

According to Hair et al. (2017, p. 281), HCM 'often involves testing higher-order structures that contain two layers of constructs'. The use of HCM allows a reduction in the number of relationships in the research model and subsequently produces a parsimonious research model (Hair et al., 2017; Becker et al., 2012, Wetzels et al., 2009).

In the context of this study, a reflective-formative type of HCM is applied in the final research model. The research model proposes 10 indicator items representing (i.e. reflective) the three dimensions of AIS effectiveness. These dimensions constitute (i.e. formative) the AIS effectiveness. Each dimension is measured by a similar number of indicator items (i.e. three to four items for each dimension). Becker et al. (2012) stated that the application of HCM is suitable when a particular construct has a similar number of indicator items. In particular, the HCM analysis applies a combination of a repeated indicators approach and a two-stage approach to assess the AIS effectiveness. Therefore, a repeated indicators approach was performed by applying the entire indicator items in each dimension to the AIS effectiveness construct. In other words, the same indicator items were used twice in the research model. Consequently, the R^2 value of that construct will always yield to one or almost one. As such, Hair et al. (2017) and Ringle et al. (2012) suggested to then perform the two-stage approach, in order to solve the issue of a high R^2 that

resulted from the use of the same indicator items in the lower order constructs (i.e. the dimensions) and higher order construct (i.e. the AIS effectiveness). Thus, a two-stage approach in HCM was implemented by using the latent variables score for the indicator items in the second-stage analysis. The validity and reliability of constructs and indicator items of each dimension in AIS effectiveness in the research model have been satisfactorily assessed prior to model analysis (see section 6.8.3).

a) First-Stage HCM Analysis of AIS Effectiveness

The bootstrapping result showed all three dimensions in AIS effectiveness to be significant at *p* value less than 1%. The result initially visualises the suitability of all dimensions to be applied as formative constructs in the second-stage HCM analysis for the AIS effectiveness. As such, a further statistical test was conducted in the second-stage HCM analysis of AIS effectiveness to clarify the capability of the three dimensions in forming the *AIS effectiveness* variable. The first-stage HCM of AIS effectiveness is illustrated in Figure 6.10.

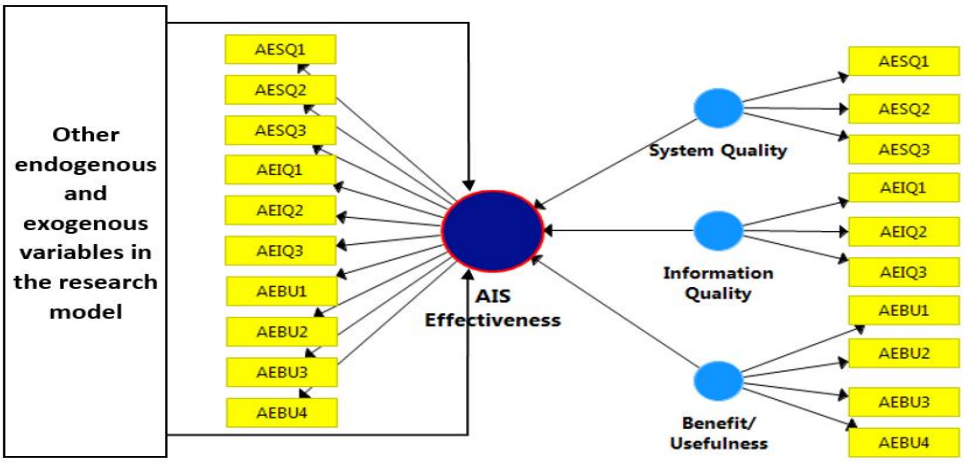
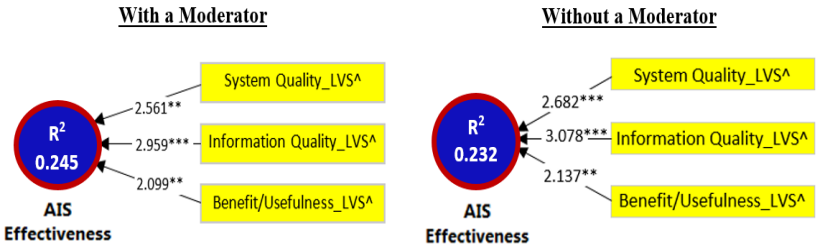


Figure 6.10: The First-Stage HCM Analysis of AIS Effectiveness

b) Second-Stage HCM Analysis of AIS Effectiveness

As identified earlier on the suitability of the three dimensions to form the *AIS effectiveness* variable, the bootstrapping result in the second-stage HCM analysis was found to be consistent with the first-stage HCM analysis. All three indicator items (i.e. *System Quality*, *Information Quality* and *Benefit/Usefulness*) that use latent variables scores (i.e. from the first-stage HCM analysis), are significant at *p* value less than 1% for *Information Quality* and less than 5% for *System Quality* and *Benefit/Usefulness* of AIS. The result suggested that the *Information Quality* highly constitutes the *AIS effectiveness* when compared to the other variables. Further, the VIF values for all second-stage formative measures are below 5.0, with a maximum value of 3.484, suggesting no critical collinearity issues between the formative indicator items. Figure 6.11 illustrates the extraction result for second-stage HCM analysis of AIS effectiveness in this study.



***p < 1%, **p < 5%, *p < 10%; ^Latent Variable Scores

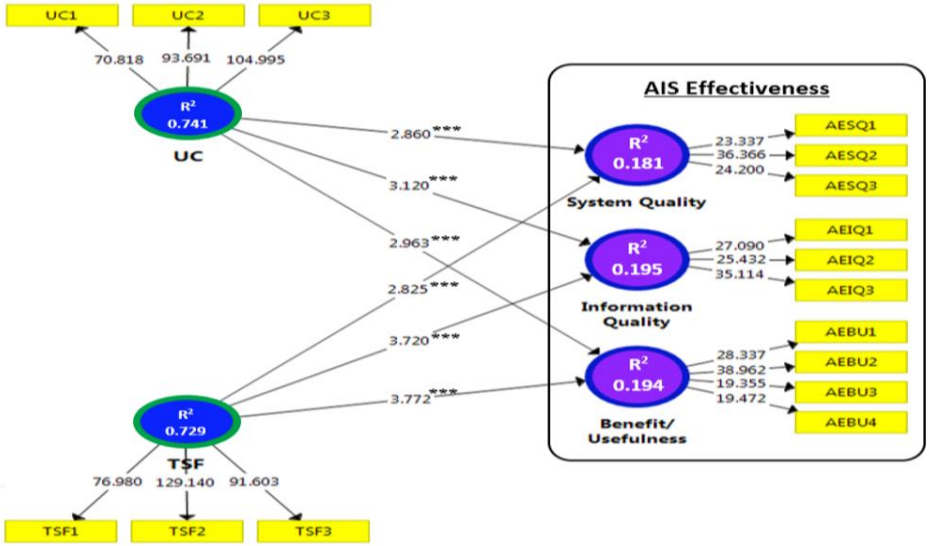
Figure 6.11: Extraction Results for Second-Stage HCM Analysis of AIS Effectiveness

iii. Quantitative Findings for the Critical Factors of AIS Effectiveness

The Main Research Model

There are two critical factors of AIS effectiveness proposed in this study: *User Commitment* (UC); and the *Technology Support Function* (TSF). In the main

research model, *AIS effectiveness* is measured based on three dimensions: *System Quality* (SQ); *Information Quality* (IQ); and *Benefit/Usefulness of AIS* (BU). These dimensions are treated separately as three dependent variables in this research model. Figure 6.12 illustrates the extracted bootstrapping result of the subpart model of AIS effectiveness from the main research model.



***p < 1%, **p < 5%, *p < 10%

Figure 6.12: The Extracted Bootstrapping Result of the Critical Factors of AIS Effectiveness (The Main Research Model) – *t* values

Based on the bootstrapping result, the R^2 values for SQ, IQ and BU are 0.181, 0.195 and 0.194, respectively. The adjusted R^2 values for SQ, IQ and BU are 0.175, 0.190 and 0.189, respectively. Generally, the result indicates that the critical factors (i.e. UC and TSF), are highly explanatory for IQ when compared to SQ and BU. Further analysis found the Q^2 value for all three dependent variables to be considerably above zero. According to Hair et al. (2017, p. 207), 'Q^2 values larger than zero for a specific reflective endogenous latent variable indicate the path model's predictive relevance for a particular dependent construct'. Specifically found

in this study, IQ has the highest Q^2 value of 0.126, followed by SQ and BU with the same Q^2 value of 0.114. The results provide clear support for the model's predictive relevance regarding the three dependent variables.

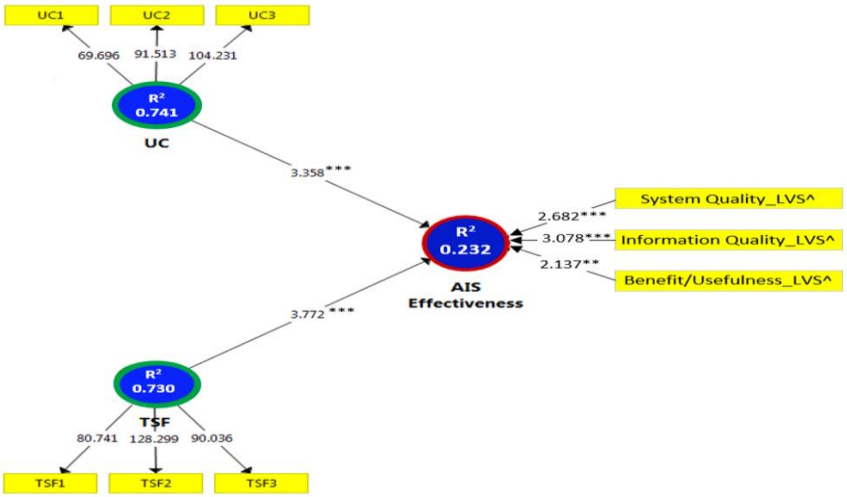
On the other hand, the bootstrapping result found both critical factors (i.e. UC and TSF) have significant positive relationships with all dimensions in *AIS effectiveness*. In particular, the result reported that the UC has the highest influence on IQ, with a *t* value of 3.120, followed closely by BU (2.963) and SQ (2.860). All are found significant at *p* values less than 1%. Concerning the UC variable, the indicator items of UC3 (i.e. AIS users' active involvement in decision-making process) is significantly loaded higher than other indicator items in the variable. In other words, UC3 highly represents the UC variable. On the other hand, TSF has the highest influence on BU, with a *t* value of 3.772, followed narrowly by IQ (3.720) and SQ (2.825). All are found significant at *p* values less than 1%. Predominantly, TSF is highly represented by TSF2 (i.e. strong data protection technology and data back-up) with the highest outer loadings when compared to other items in the variable.

To summarise, the findings suggest the importance of user commitment and technology support functions towards all dimensions in AIS effectiveness. In other words, highly committed system users, and support from technology, lead to high quality information, high quality systems and great benefit/usefulness from the system. In addition, the AIS users' active involvement in decision-making highly represents user commitment. On the other hand, strong data protection technology and data back-up procedures are strongly representative of the technology support function. Furthermore, both critical factors are found to have the highest influence on

the information quality and the benefit/usefulness of AIS, followed by the system quality. At a glance, the technology support function has a great influence on AIS effectiveness when compared to user commitment.

The Final Research Model – Second-Stage HCM Analysis

The second-stage HCM analysis of AIS effectiveness in this study exhibits a formative-based measure of the *AIS effectiveness* using the three dimensions as indicator items. Based on this result, it is reported that the R^2 value of *AIS effectiveness* is 0.232, with an adjusted R^2 of 0.227. In other words, UC and TSF together explain about 23.2% of AIS effectiveness, based on the user satisfaction perspective. The R^2 for AIS effectiveness of this study is consistent with some other studies conducted in AIS research field and information research field. Particularly, several studies related to AIS, ERP and computerised accounting system reported similar R^2 ranged from 0.17 to 0.34. For example: Nicolaou (2000) reported R^2 value of 0.29 for AIS effectiveness; Choe (1998) reported R^2 values of 0.17 and 0.24 for management accounting system; Ilias and Zainudin (2013) reported R^2 values of 0.199 and 0.208 for actual use of computerised accounting system and attitude towards using the system, respectively; Doud and Triki (2013) reported R^2 value of 0.275 for system quality; and pornpandejwittaya (2012) reported R^2 values that ranged from 0.25 to 0.34 for AIS effectiveness models. The extracted bootstrapping result of the subpart model of AIS effectiveness from the final research model is shown in Figure 6.13.



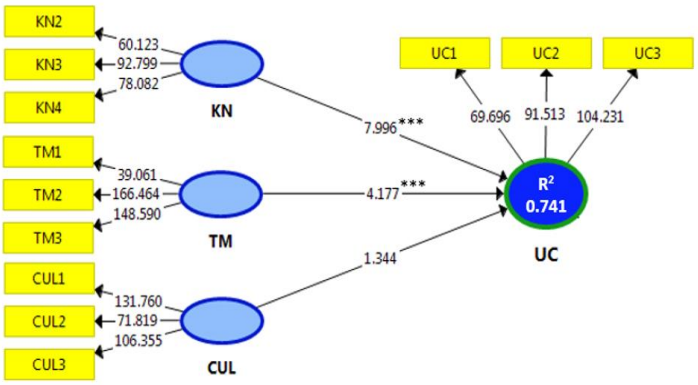
***p < 1%, **p < 5%, *p < 10%

Figure 6.13: The Extracted Bootstrapping Result of the Critical Factors of AIS Effectiveness (The Final Research Model) – *t* values

Furthermore, the result of the relationships analysis between the critical factors and AIS effectiveness are consistent with the main research model's findings. Both factors, UC and TSF, have a positive significant relationship with AIS effectiveness at *p* values less than 1%. Specifically, TSF reported a stronger effect on AIS effectiveness, with a *t* value of 3.772, compared to UC (3.358). The result is consistent with the earlier finding for the main research model. The result suggests a stronger reliance on technology support function for the effectiveness of AIS when compared to user commitment.

iv. Quantitative Findings of the Antecedents for User Commitment

The antecedents for *User Commitment* (UC) are the independent variables for UC in which UC is a dependent variable for the antecedents in the research model of this study. There are three antecedents in the subpart model of UC, which are *Knowledge* (KN), *Top Management Support* (TM) and *Culture* (CUL). Figure 6.14 shows the extracted bootstrapping result of the subpart model of the antecedents for UC.



***p < 1%, **p < 5%, *p < 10%

Figure 6.14: The Extracted Bootstrapping Result of the Antecedents for User Commitment

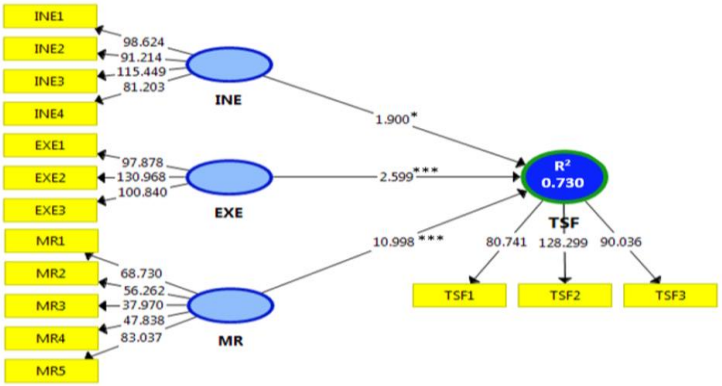
The results show an R^2 value for UC of 0.741, with an adjusted R^2 value of 0.739. Further analysis reported a Q^2 value of 0.634 indicating predictive relevance of the subpart model of user commitment. On the other hand, the result reported that KN and TM significantly influence UC, with positive relationships at *p* value less than 1%. In particular, KN strongly influences UC with a *t* value of 7.996 when compared to TM (*t* value = 4.177). However, CUL is reported to have an insignificant relationship with UC. Specifically, KN3 (i.e. AIS user's experience in accounting and the system) is found to significantly load the highest loading on KN. In addition, TM2 (i.e. top management appreciation and utilisation of information produced by the AIS) and TM3 (i.e. top management encourages the improvement of AIS) are shown to be the highest significant outer loadings when compared to other indicator items in the TM.

In other words, the result implies the importance of knowledge and top management support in encouraging user commitment towards the AIS. The result indicates strong knowledge leads to higher commitment among the AIS users. In addition, strong support from top management will increase the AIS users'

commitment towards the system. Specifically, the AIS user's experience in accounting and the system, the top management appreciation and utilisation of information produced by the system and the top management encouragement towards the system improvement, are hugely important in encouraging user commitment towards the system.

v. Quantitative Findings of the Antecedents for the Technology Support Function

There are three antecedents for *Technology Support Function* (TSF), as proposed in the research model: *Internal Expert* (INE); *External Expert* (EXE); and *Monitoring and Review* (MR). These antecedents are independent variables of TSF. TSF is a dependent variable in this subpart model. The R^2 value for TSF is 0.730, with an adjusted R^2 value of 0.727. In addition, the Q^2 value for TSF is 0.642, suggesting predictive relevance of the subpart model of TSF. Figure 6.15 shows the extracted bootstrapping result of the subpart model of the antecedents for TSF.



***p < 1%, **p < 5%, *p < 10%

Figure 6.15: The Extracted Bootstrapping Result of the Antecedents for the Technology Support Function

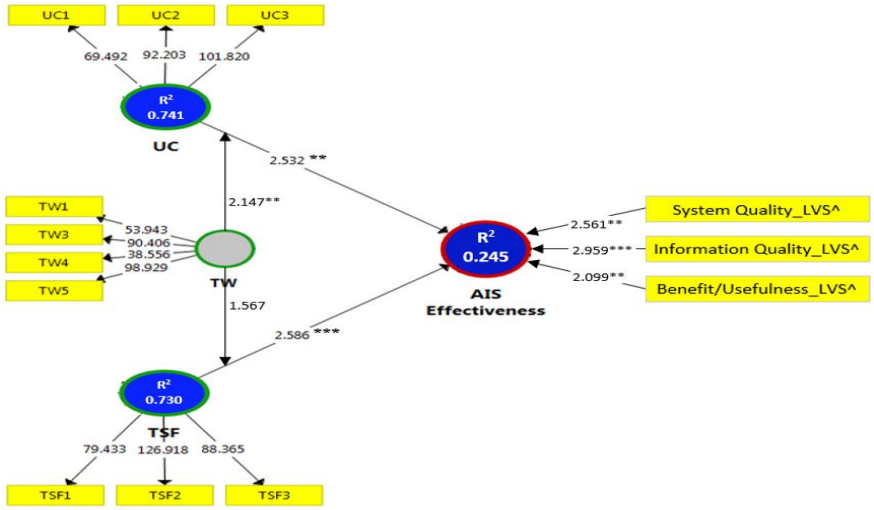
Focusing on the relationship between the variables in the subpart model, all variables are found to have significant positive relationships with TSF. MR has the strongest influence on TSF with a *t* value of 10.998 that is significant at *p* value less than 1%. The strength of significant relationship is followed by EXE with a *t* value of 2.599 (i.e. significant at $p < 1\%$) and INE with a *t* value of 1.900 (i.e. significant at $p < 10\%$). In details analysis, MR is highly loaded by MR5, which is the performance of periodic review on the manual guideline and SOP. On the other hand, EXE2, which is vendor/consultant understanding of an organisation's requirements, is the highest significant loading on EXE as compared to other indicator items in the variable. In addition, adequate technical support from the headquarters (i.e. INE3) is found to be the highest significant loading in INE.

Given these points, highly practising the monitoring and review activities, with a specific concern placed on reviewing the manual guidelines and SOP of the AIS, leads to strong support of technology towards the system. Further, strong support from external experts, especially in terms of their understanding of organisation's requirement, contributes to a better technology support function towards the system. Moreover, strong attention from the internal expert, particularly in terms of adequate technical support from the headquarters, drives strong technology support function towards system effectiveness. Furthermore, technology performance relies more on external experts than on internal experts.

vi. Quantitative Findings of the Moderator Variable

The moderator variable in this study examines the impact of *Teamwork* (TW) on the relationships between: (i) *User Commitment* (UC) and *AIS effectiveness*; and (ii)

Technology Support Function (TSF) and *AIS effectiveness*. Thus, the moderator impact on the relationships was assessed in the final research model, with the *AIS effectiveness* as a dependent variable. TW uses reflective-based measures, with five indicator items. However, due to the discriminant validity problem, item TW2 (i.e. actively share useful information among staffs) was removed from the construct. Based on the results of reliability and validity tests after removing the TW2, the TW construct and its indicator items satisfactorily met all relevant criteria for measurement model assessment. The result suggested that the TW construct was ready for the next analysis. Figure 6.16 shows the extraction result for the AIS effectiveness subpart model from the final research model, incorporating the moderator.



****p* < 1%, ***p* < 5%, **p* < 10%; ^Latent Variable Scores

Figure 6.16: The Extraction Result for the Subpart Model of AIS Effectiveness with a Moderator (*t* values)

Statistically, UC and TSF have a significant positive relationship with *AIS effectiveness*. In other words, the effectiveness of AIS is reliant on the performance of user commitment and technology capability to support the system. In practice, the

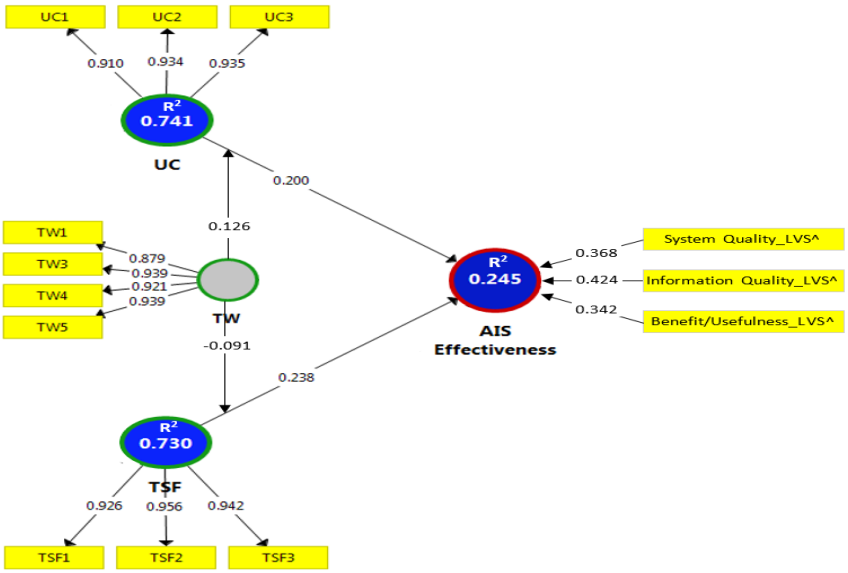
accounting processes require several personnel from various levels of management to complete a task. Therefore, teamwork practice is believe to moderate system reliance on the critical factors (i.e. UC and TSF) in order to be effective.

Furthermore, estimation of the moderating effect was performed by applying a two-stage calculation approach in creating the interaction term and standardising[4] the data for the analysis. The use of a two-stage approach in analysing moderator effect is recommended by Hair et al. (2017, p. 263) 'when the aim is to disclose a significant moderating effect'. In addition, the standardisation of data facilitates the interpretation of average performance instead of zero performance, as explained in Hair et al. (2017).

With reference to Figure 6.17, the interaction term of UC and TW is found to have a significant positive effect on *AIS effectiveness* (i.e. path coefficient: 0.126) at a *p* value less than 5%. Consistently, the confidence interval does not include zero. The 95% bias-corrected bootstrap confidence interval of the interaction term's effect is [0.025, 0.218]. Furthermore, the simple effect of UC on *AIS effectiveness* is 0.200 (i.e. path coefficient). The result suggests that the relationship between UC and *AIS effectiveness* is 0.200 for an average performance level of TW. Statistically, an increase of one standard deviation unit in TW will result in an increment of the relationship between UC and *AIS effectiveness* by the size of the interaction term (0.126). Thus, the relationship between UC and *AIS effectiveness* becomes 0.200 + 0.126 = 0.326. In other words, any increase in TW will strengthen the relationship between UC and *AIS effectiveness*. The result also reported that the interaction term's f^2 effect size is 0.15, indicating a medium effect as per Cohen (1988). Figure 6.18

[4] The results of either applying standardised data or mean centered to examine the moderation effect in this study are almost similar. There is no significant difference noted.

visualises the moderating effect of TW on the relationship between UC and *AIS effectiveness.*



***p < 1%, **p < 5%, *p < 10%; ^Latent Variable Scores

Figure 6.17: The Extraction of Algorithm Result for the Subpart Model of AIS Effectiveness with a Moderator (path coefficients)

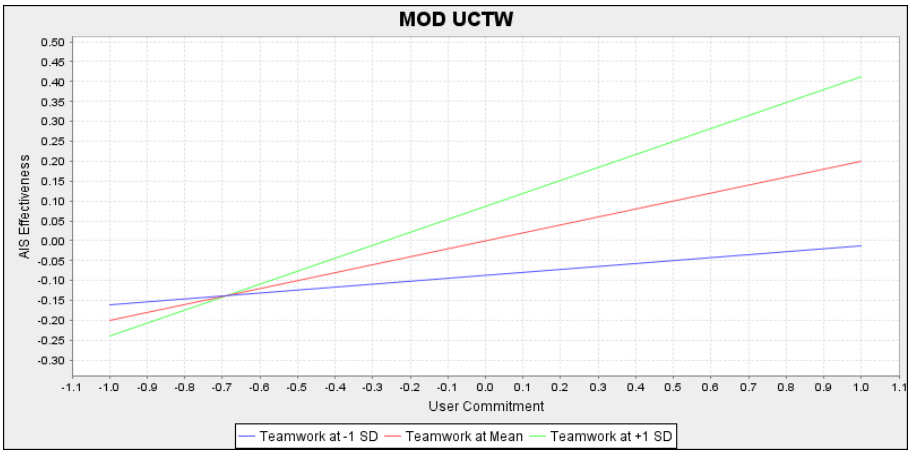


Figure 6.18: The Moderating Effect of *Teamwork* on the Relationship between *User Commitment* and *AIS Effectiveness*

On the other hand, the interaction term of TSF and TW is found to have a negative effect on *AIS effectiveness* (-0.091). However, it is statistically not

significant, with a *t* value of 1.567. The result suggests that the reliance on technology for AIS effectiveness cannot be moderated by teamwork practice. After all, strong support from technology to operate the system is crucial for the effectiveness of AIS, without any influence from teamwork within the organisation.

6.8.4 Multi-Group Analysis

Like other statistical methods, PLS-SEM also assumes that the analysed data is homogenous and represents the observed population. However, in real practice, homogeneity is seemed to be unrealistic 'because individuals are likely to be heterogeneous in their perceptions and evaluations of latent constructs' (Sarstedt et al., 2011, p. 196). Therefore, Multi-Group Analysis (MGA) allows the examination of statistical differences in the estimation results (i.e. loadings, weight and path coefficients) between data groups in a population (Hair et al., 2017).

MGA is a pairwise test based that is used to compare between two groups in a population at a time. MGA in this study was assessed using PLS-MGA by applying a complete bootstrapping, BCa, two-tailed at 5% significant level following a commonly acceptable setting. Thus, *p* values lower than 5% and higher than 95% indicate a significant difference between the assessed groups at a significant level of 5%. In particular, *p* values of more than 95% suggesting that the first group's weight is stronger than the second group. On the other hand, *p* values of less than 5% meaning that the second group's weight is stronger than the first group. The MGA was performed on the main research model and the final research model that incorporates a moderator variable for the subpart model of *AIS effectiveness*. However, the subpart models of *User Commitment* and *Technology Support Function*

are the same in both research models because the HCM analysis does not significantly affect these subpart models. Thus, the MGA for these subpart models is performed on the final research model only.

i. Multi-Group Analysis for Organisational Characteristics

As discussed in the previous chapters (i.e. Chapters 4, section 4.7.4, page 221 and Chapter 5, section 5.3.6, page 243), the size of an organisation and the background of a department might lead to variances in the AIS users' perception towards the system and its environment. The details of the groups created for this analysis are shown in Table 6.11.

Table 6.11: Organisational Characteristics Group Details

Description	Score	Group Name Applied in this Section
1) Organisation Size		
- Small ministry	1	Group 1A
- Large ministry	2	Group 2A
2) Background of Department		
- Accounting office	1	Group 1B
- Responsibility centre	2	Group 2B

Prior to MGA, common tests for a measurement model on the validity and reliability of the variables and all of its indicator items were examined for each group in both research models (i.e. the main research model and the final research model). The analysis of the main research model reported that the outer loadings for one item (i.e. AEBU4) in Group 1A and Group 2B, have a value of 0.619 and 0.633, respectively. Both are below the threshold of 0.7. In social science studies, it is typical to obtain outer loadings below 0.7, especially for exploratory studies (Hulland, 1999). Birkinshaw et al. (1995) suggested that any items with outer loadings above 0.6 should be retained. However, items with outer loadings below 0.4

should always be removed from the construct (Hair et al., 2014; Hulland, 1999). Moreover, the analysis on the population has satisfactorily established the convergent validity for all constructs. On the other hand, the group analysis on the final research model, incorporating a moderator variable, reported that all outer loadings values are well above 0.7.

Further analysis on the AVE of all constructs for each group shows that all values are above 0.5 in both research models. The result indicates that the convergent validity for all groups have been satisfactorily justified in the research models (i.e. main research model and final research model) of this study. Next, the results for both research models reported Cronbach's alpha and composite reliability values of all constructs for all groups are well above 0.7 suggesting the internal consistency reliability of all constructs. Following that, cross-loadings and Fornell-Larcker analysis reported the establishment of discriminant validity for all groups in the research models. Furthermore, the VIF values of all constructs in the both research models are well below 5.0, suggesting no critical collinearity problem in any group. The summary of the measurement model for all groups representing the organisational characteristics are reported in Table 6.12 for both the main research model and the final research model incorporating a moderator variable.

After all requirements for the measurement model of each group were met, the MGA analysis for both research models was performed accordingly. The results found that there are significant differences between the groups representing the size of organisation and the background of department towards some of the relationships in the research models. Table 6.13 summarises the findings on the significant differences between the groups of organisational characteristics.

Table 6.12: The Summary of Measurement Model for Organisational Characteristics Groups

	Organisation Size		Background of Department	
Both Research Models:	Group 1A	Group 2A	Group 1B	Group 2B
All outer loading > 0.6?	Yes	Yes	Yes	Yes
All AVE values > 0.5?	Yes	Yes	Yes	Yes
All Cronbach's alpha values > 0.7?	Yes	Yes	Yes	Yes
All composite reliability values > 0.7?	Yes	Yes	Yes	Yes
Discriminant validity established?				
- Cross-Loading	Yes	Yes	Yes	Yes
- Fornell-Larcker	Yes	Yes	Yes	Yes
All VIF values < 5.0	Yes	Yes	Yes	Yes
N	111	216	203	124
The Main Research Model:				
R^2 for System Quality	0.191	0.180	0.190	0.192
R^2 for Information Quality	0.188	0.188	0.257	0.108
R^2 for Benefit/Usefulness	0.211	0.187	0.222	0.197
The Final Research Model (with a Moderator)				
R^2 for AIS Effectiveness	0.241	0.246	0.293	0.265
R^2 for User Commitment	0.668	0.774	0.743	0.748
R^2 for Technology Support Function	0.719	0.739	0.727	0.740

Table 6.13: MGA Findings on the Significant Differences between the Groups of Organisational Characteristics

Relationship	Path Coefficients (differences)	*p*-Value	Confidence Intervals (Bias Corrected) for both Groups does not include one?	Result by Group
1) *The Main Research Model:*				
Background of Department				
TSF → BU	0.322	0.020	Yes	1B < 2B
UC → BU	0.294	0.978	Yes	1B > 2B
2) *The Final Research Model (with a Moderator):*				
Organisation Size				
Moderating effect on UC → *AIS Effectiveness*	0.251	0.969	Yes	1A > 2A

Background of the Department

The analysis between groups for the main research model reported a significant difference between the groups of departmental background on the relationship between TSF and BU. Particularly, Group 2B (i.e. the responsibility centre) strongly perceived the significance of technology support function in realising the benefit/usefulness of AIS when compared to Group 1B (i.e. the accounting office).

Consistent with that, the path coefficient for Group 1B is significantly higher than Group 2B on a relationship between UC and BU. It means that the group of respondents from the accounting office perceived that the system users have to be committed in order to gain benefit/usefulness from the system. Their perception on the importance of user commitment in order to obtain high satisfaction on the benefit/usefulness of AIS is at least stronger than the respondents from the responsibility centre.

On the other hand, there is no significant difference between groups for analysis performed on the final research model with regards to the departmental background. Both groups have similar perceptions on the relationships in the final research model including the moderator effect. This is not surprising because the significant differences found in the main research model with regards to the background of department are mainly on the dimensions of AIS effectiveness. These dimensions were combined to form an *AIS effectiveness* variable in the final research model. Thus, the result indicates that, overall, there is no significant difference between the groups of departmental background towards the relationship between the critical factors and AIS effectiveness.

Organisation Size

The MGA result for the main research model did not find any significant differences between the groups of organisation size on the relationships in the model. The result suggests consistent opinions among the AIS users, regardless of the organisation size they are from.

On the other hand, the MGA results for the final research model incorporating a moderator found the moderating effect of teamwork practice towards the relationship between UC and *AIS effectiveness* is significantly higher for Group 1A when compared to Group 2A. The finding indicates that teamwork in small ministries strengthens the influence of user commitment towards AIS effectiveness, relative to large ministries. In other words, the impact of teamwork on the relationship between user commitment and AIS effectiveness is perceived stronger by the AIS users in small ministries when compared to the users in large ministries.

ii. Multi-Group Analysis for Individual Characteristics

An individual's perception can be influenced by their specific background as discussed in details in Chapter 4, section 4.7.5, page 223 and Chapter 5, section 5.3.7, page 244. In this study, individual backgrounds, which are the qualification of educational background and educational level, are examined accordingly. The test aimed to see if there are differences in their perception towards the estimation results obtained from the analysis conducted on the research models. The specific group name, details and scores are shown in Table 6.14.

Similar to MGA for organisational characteristics, reliability and validity tests were performed for the groups in individual characteristics. The result shows only one item, AEBU4 (0.688) in Group 2D, had an outer loading value below 0.7.

However, the item is retained because the value is above 0.6 (i.e. it does not severely deviate from the threshold of 0.7). In addition, data screening and necessary treatment were performed during the analysis for the whole population. Besides, the AVE values of each construct for all the groups in individual characteristics are well above 0.5, suggesting the establishment of convergent validity in the research model.

Table 6.14: Individual Characteristics Group Details

Description	Score	Group Name Apply in This Section
1) The Qualification of Educational Background		
- Solely in accounting field.	1	Group 1C
- Mixed (accounting and other fields) or non-accounting field.	2	Group 2C
2) Education Level		
- Ph.D, master's degree and bachelor's degree.	1	Group 1D
- Diploma/*STPM*/A-Level, *SPM* and other.	2	Group 2D

Furthermore, the values of Cronbach's alpha and composite reliability for all constructs of each group are found to be higher than 0.7, indicating the internal consistency reliability of all constructs throughout the research models. Subsequently, the results of cross-loadings and Fornell-Larcker reported that the discriminant validity for all constructs in each group are established accordingly for both research models. In addition, the VIF values of all constructs are considerably below 5.0, suggesting that there is no serious collinearity issue between the constructs for all groups in the research models. Therefore, the research models that are specified for each group are ready for further analysis. In summary, the reliability and validity analysis result for all groups of individual characteristics are shown in Table 6.15.

Table 6.15: The Summary of Measurement Model for Individual Characteristics Groups

	Qualification of Educational Background		Education Level	
Both Research Models:	Group 1C	Group 2C	Group 1D	Group 2D
All outer loading > 0.6?	Yes	Yes	Yes	Yes
All AVE values > 0.5?	Yes	Yes	Yes	Yes
All Cronbach's alpha values > 0.7?	Yes	Yes	Yes	Yes
All Composite reliability values > 0.7?	Yes	Yes	Yes	Yes
Discriminant validity established?				
- Cross-Loading	Yes	Yes	Yes	Yes
- Fornell-Larcker	Yes	Yes	Yes	Yes
All VIF values < 5.0	Yes	Yes	Yes	Yes
N	211	116	181	146
The Main Research Model:				
R^2 for System Quality	0.240	0.142	0.232	0.132
R^2 for Information Quality	0.234	0.152	0.274	0.138
R^2 for Benefit/Usefulness	0.214	0.169	0.229	0.155
The Final Research Model (with a Moderator)				
R^2 for AIS Effectiveness	0.302	0.190	0.325	0.184
R^2 for User Commitment	0.741	0.770	0.792	0.661
R^2 for Technology Support Function	0.746	0.725	0.735	0.741

Next, the MGA is performed for the main research model and the final research model incorporating a moderator variable, in order to test the significant differences on the estimation results between the groups. As mentioned previously, the MGA result for the subpart model of *User Commitment* and *Technology Support Function* has no significant differences between both research models because the HCM analysis only affects the subpart model of AIS effectiveness. Based on the MGA result, there are significant differences between the groups of individual characteristics. In practice, the AIS user's education level and qualification of educational background commonly reflects their position within an organisation in the Government. Different positions will use the AIS differently, thus this may be the reason behind differences in opinions. The summary of MGA for individual characteristics is reported in Table 6.16.

Table 6.16: MGA Findings on the Significant Differences between Groups of Individual Characteristics

Relationship	Path Coefficients (differences)	*p*-Value	Confidence Intervals (Bias Corrected) for both Groups does not include one?	Result by Group
1) *The Main Research Model:*				
Education Level				
UC → IQ	0.356	0.004	Yes	1D < 2D
2) *The Final Research Model:*				
Qualification of Education Background				
CUL → UC	0.314	0.005	Yes	1C < 2C
TM → UC	0.260	0.954	Yes	1C > 2C
Education Level				
EXE → TSF	0.275	0.018	Yes	1D < 2D

Qualification of Educational Background

The analysis on the groups that represent the qualification of educational background found significant differences for the relationships, mainly in the subpart model of user commitment. The significant differences are reported for the relationship between; (i) CUL and UC, (ii) TM and UC.

In particular, the qualification of educational background is found to have a significant difference between Group 1C and Group 2C in a relationship between CUL and UC. The path coefficient of Group 1C is found to be smaller than the path coefficient of Group 2C. In other words, the finding about culture has a positive relationship with user commitment, is easily observed by the respondents with an educational background of mixed (i.e. accounting and other fields) or non-accounting qualification, as compared to the respondents with a solely accounting qualification of educational background.

However, in terms of the relationship between TM and UC, Group 1C has larger path coefficients when compared to Group 2C. The result implies that system

users with a qualification solely in accounting greatly perceive the importance of top management support in encouraging AIS user commitment, when compared to the system's users with mixed or non-accounting backgrounds of education qualification.

Education Level

Concerning the MGA result for education level groups, significant differences on the relationships are found in the subpart model of technology support function and the subpart model of information quality. Specifically, there are significant differences between the groups' perception on the relationships between: (i) UC and IQ; (ii) EXE and TSF.

In particular, the path estimation results for Group 1D is found to be smaller than Group 2D in the relationship between UC and IQ. In other words, the respondents with a diploma or lower perceived the importance of user commitment towards the quality of information to be at least stronger than the respondents with a bachelor's degree or higher.

Furthermore, Group 1D is also found to have a smaller path coefficient result when compared to Group 2D in a relationship between EXE and TSF. In other words, the importance of an external expert towards the technology function is more highly perceived by respondents holding a diploma level or lower, compared to respondents with a bachelor's degree level or higher.

On the other hand, the MGA result for the final research model incorporating a moderator variable reported a consistent finding between groups on the estimation result for the subpart model of AIS effectiveness. The result suggests that there is no

significant difference between groups in education level when the dimensions in AIS effectiveness are combined into one dependent variable.

6.8.5 Performance Gap of the Critical Factors of AIS Effectiveness and Its Antecedents

The analysis of perceived importance versus perceived performance in this study was performed using an Importance-Performance Analysis (IPA) matrix on the critical factors of AIS effectiveness, including a moderator, and the antecedents for each factor. The assessment was conducted separately for each subpart model in the final research model of this study. The mean values of each item were used to generate scatter plot graphs. Central tendency for important and performance axis in this study uses mean values of the variables in each of the subpart models. This follows the suggestion by Martilla and James (1977, p. 79) that if the mean and median values 'appear reasonably close, use the mean to avoid discarding the additional information they contain'.

Based on the descriptive analysis of the mean and median values of the variables for each subpart model, the highest value of mean-median differences across the three subpart models is 0.035. This indicates the mean and median are reasonably close, suggesting it is suitable to use mean values as the central tendency in the IPA matrix. The results of the IPA matrix of this study are visualised in scatter plot graphs illustrating four quadrants following the original structure of presenting the IPA results as discussed in Chapter 2, section 2.8, page 113. The summary of results for all subpart models is shown in Table 6.17.

Table 6.17: The Summary of IPA Results for All Subpart Models

Item	Description	Important			Performance			IPA
		Mean	Median	SD#	Mean	Median	SD#	Result
A. The Critical Factors of AIS Effectiveness including a Moderator (Variable: *Technology Support Function, Teamwork* and *User Commitment*)								
TSF1	Up-to-date hardware and software.	4.431	4.000	0.592	3.312	3.000	0.883	Quadrant I
TSF2	Strong data protection technology and back-up.	4.450	5.000	0.594	3.376	3.000	0.880	Quadrant I
TSF3	Integration between systems in the government (i.e. GFMAS integrated with other e-Government systems).	4.428	4.000	0.617	3.312	3.000	0.920	Quadrant I
TW1	Effective communication between levels of management (i.e. top, middle and lower).	4.419	4.000	0.595	3.339	3.000	0.828	Quadrant I
TW3	There is a good relationship between AIS users in the accounting office.	4.388	4.000	0.591	3.492	3.000	0.779	Quadrant II
TW4	There is a good relationship between accounting office and other departments within the organisation (i.e. ministry).	4.376	4.000	0.598	3.456	3.000	0.801	Quadrant II
TW5	There is a high cooperation among AIS users within the Government.	4.388	4.000	0.591	3.425	3.000	0.759	Quadrant II
UC1	Compliance with SOP, policies, standards, rules and regulations.	4.391	4.000	0.669	3.492	3.000	0.791	Quadrant II
UC2	Prioritise the use of AIS.	4.119	4.000	0.623	3.425	3.000	0.747	Quadrant IV
UC3	Actively involved in the decision-making process (i.e. within group, department or in higher level of management).	4.159	4.000	0.645	3.434	3.000	0.780	Quadrant IV
B. The Antecedents for User Commitment (Variable: *Culture, Knowledge* and *Top Management Support*)								
CUL1	Appreciative and supportive environment towards technology enhancement.	4.385	4.000	0.585	3.391	3.000	0.836	Quadrant II
CUL2	Open door policy to encourage employees to seek for advice, offer suggestions and actively exchange ideas.	4.404	4.000	0.588	3.401	3.000	0.866	Quadrant II
CUL3	Transfer of knowledge from internal expert to other AIS users.	4.388	4.000	0.596	3.358	3.000	0.856	Quadrant I
KN2	AIS user has academic qualification in accounting or finance (with basic accounting).	4.174	4.000	0.707	3.532	3.000	0.742	Quadrant IV
KN3	AIS user has experience in accounting and the system.	4.113	4.000	0.666	3.431	3.000	0.791	Quadrant IV
KN4	AIS user understands the function and process in AIS.	4.220	4.000	0.651	3.355	3.000	0.761	Quadrant III

Continue…

…continue

Item	Description	Important			Performance			IPA
		Mean	Median	SD[#]	Mean	Median	SD[#]	Result
B. The Antecedents for User Commitment (Variable: *Culture, Knowledge* and *Top Management Support*) - continue								
TM1	Manager/supervisor encourages employees to attend training.	4.462	5.000	0.589	3.355	3.000	0.870	Quadrant I
TM2	Top management appreciate and utilise the information produced by AIS.	4.333	4.000	0.598	3.321	3.000	0.857	Quadrant I
TM3	Top management encourages the improvement of AIS.	4.336	4.000	0.609	3.346	3.000	0.883	Quadrant I
C. The Antecedents for Technology Support Function (Variable: *External Expert, Internal Expert* and *Monitoring and Review*)								
EXE1	Vendor/consultant provides adequate technical support.	4.321	4.000	0.663	3.248	3.000	0.834	Quadrant III
EXE2	Vendor/consultant is clearly understand the organisation's (i.e. ministry and the Government) requirements.	4.346	4.000	0.660	3.214	3.000	0.877	Quadrant III
EXE3	Vendor/consultant is experienced.	4.339	4.000	0.672	3.223	3.000	0.870	Quadrant III
INE1	IT department provides adequate technical support.	4.355	4.000	0.614	3.358	3.000	0.856	Quadrant II
INE2	IT department gives prompt feedback.	4.346	4.000	0.626	3.318	3.000	0.845	Quadrant III
INE3	The headquarters (i.e. the AGD) provides adequate technical support	4.413	4.000	0.584	3.404	3.000	0.834	Quadrant II
INE4	The person in charge at the headquarters (i.e. the AGD) is experienced.	4.425	4.000	0.596	3.453	3.000	0.845	Quadrant II
MR1	Comparing the current AIS with AIS in other developing countries to ensure that the system in use is not outdated or using obsolete technology.	4.180	4.000	0.710	3.153	3.000	0.927	Quadrant III
MR2	Comparing the current AIS with AIS in developed countries to encourage improvement of the system.	4.180	4.000	0.706	3.165	3.000	0.925	Quadrant III
MR3	Performing inspection (*naziran*) of documentation and procedure.	4.419	4.000	0.611	3.572	3.000	0.772	Quadrant II
MR4	System audit (system check) in order to ensure the system operates as required with a strong internal control and security.	4.437	4.000	0.613	3.462	3.000	0.786	Quadrant II
MR5	Periodic review on the manual guideline and SOP of AIS to ensure any changes made to the system are documented and updated accordingly.	4.413	4.000	0.610	3.410	3.000	0.838	Quadrant II

[#]Standard Deviation

i. The Critical Factors of AIS Effectiveness and the Moderator

The critical factors of AIS effectiveness and a moderator consist of 10 items (i.e. attributes) representing three variables: *User Commitment* (UC); *Technology Support Function* (TSF); and *Teamwork* (TW). UC and TSF are identified as the critical factors of AIS effectiveness. On the other hand, TW is a moderator between the critical factors and the AIS effectiveness. Based on the result, the items in this subpart model are scattered around Quadrant I, Quadrant II and Quadrant IV. The mean values of the items for perceived importance ranged from 4.119 to 4.450. On the other hand, the mean values of the items for perceived performance ranged from 3.312 to 3.492. Figure 6.19 shows the IPA matrix for this subpart model.

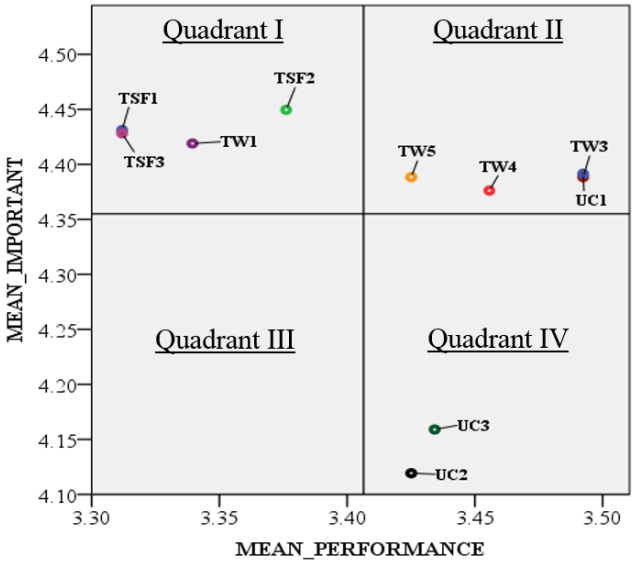


Figure 6.19: IPA Matrix for the Critical Factors of AIS Effectiveness and the Moderator

In Quadrant I (*Concentrate here*), there are TSF1, TSF2, TSF3 and TW1 plotted in the quadrant. The result indicates that the items are highly important but not performed well. In other words, the technology function to support the AIS in terms of up-to-date hardware and software, strong data protection and back-up,

integration with other systems in the Government and the communication between management levels (i.e. top, middle and lower) are perceived as not effectively practiced; at least below the average level of perceived performance.

In Quadrant II (*Keep up the good work*), UC1, TW3, TW4 and TW5 are found scattered in the quadrant. These items are highly important and performed well in the Malaysian Federal Government organisations. These items represent the attributes of user compliance on related rules and regulations, good relationships between users in the accounting office as well as between the accounting office and other departments, and high cooperation among system users within the Government.

In Quadrant IV (*Possible overkill*), UC2 and UC3 are found. This quadrant shows the items that are not really important but performed well. These items are user prioritisation to use the AIS and user active involvement in the decision-making process. These attributes have been performed more than their importance level would suggest they should be.

ii. Antecedents for User Commitment

The antecedents for user commitment composed of nine items that are used to represent three variables, which are *Culture* (CUL), *Knowledge* (KN) and *Top Management Support* (TM). With reference to the descriptive result of this subpart model, the mean values of the items for perceived importance ranged from 4.113 to 4.462, while for perceived performance the values ranged from 3.321 to 3.532. These items are found scattered around all four quadrants in the IPA matrix. Figure 6.20 illustrates the scatter plot of the items in the graph.

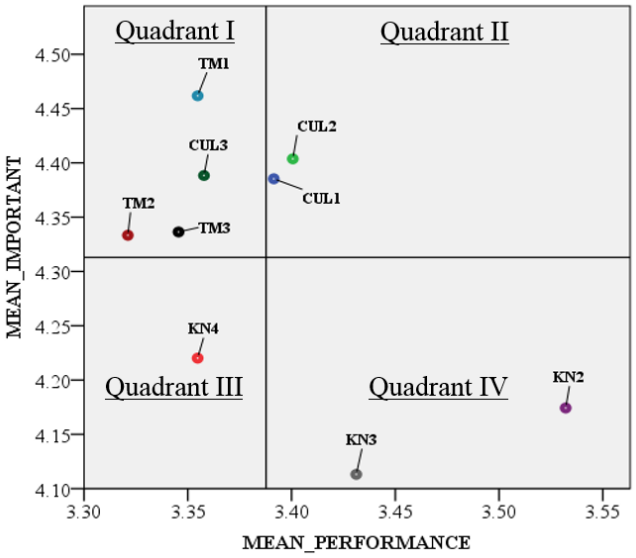


Figure 6.20: IPA Matrix of the Antecedents for User Commitment

Based on the IPA matrix result, TM1, TM2, TM3 and CUL3 are found in Quadrant I (*Concentrate here*). In particular, TM1, TM2 and TM3 represent top management support in terms of managers/supervisors encouraging their staff to attend training, top management appreciation and utilisation of information produced by the AIS and top management encouragement in the improvement of AIS. On the other hand, CUL3 is one of the measures representing culture in terms of transfer of knowledge from internal experts to other system's users. These attributes (i.e. TM1, TM2, TM3 and CUL3) are perceived as highly important by the AIS users. However, the performance of these attributes is below the average level of perceived performance.

Furthermore, CUL1 and CUL2 are grouped in Quadrant II (*Keep up the good work*), indicating good performance from these highly important attributes. CUL1 and CUL2 reflect the culture of an organisation in the context of AIS. Precisely, CUL1 is appreciative and supportive environment towards technology improvement

and CUL2 is an open door policy to encourage the AIS users to seek for advice, offer their opinions and actively exchange ideas.

On the other hand, Quadrant III (*Low priority*) contains KN4 and Quadrant IV (*Possible overkill*) contains KN2 and KN3. All of these items represent knowledge measures related to the AIS. KN4, which is about users understanding of the function and process in the AIS, is reported as low priority. This attribute is perceived below the average level of importance and performance. On the other hand, KN2 is about AIS users' academic qualification in accounting or finance (i.e. with basic accounting), whereas, KN3 represents the system's users' experience in accounting and AIS practice. Both attributes are perceived as not really important in encouraging AIS user commitment towards the system. However, it is reported that most of the AIS users have accounting qualifications and high level of experience in accounting and AIS practice; at least above the average level of performance.

iii. Antecedents for the Technology Support Function

The antecedents for technology support function comprise of 12 items representing three variables, which are *External Expert* (EXE), *Internal Expert* (INE) and *Monitoring and Review* (MR). With reference to the IPA matrix, the items in this subpart model are scattered around Quadrant II and Quadrant III only. This indicates the distribution of items in the antecedents for technology support function is either highly important with high performance, or less important with low performance. The mean values of the items range from 4.180 to 4.437 for perceived importance and 3.453 to 3.572 for perceived performance. The result of the IPA matrix is shown in Figure 6.21.

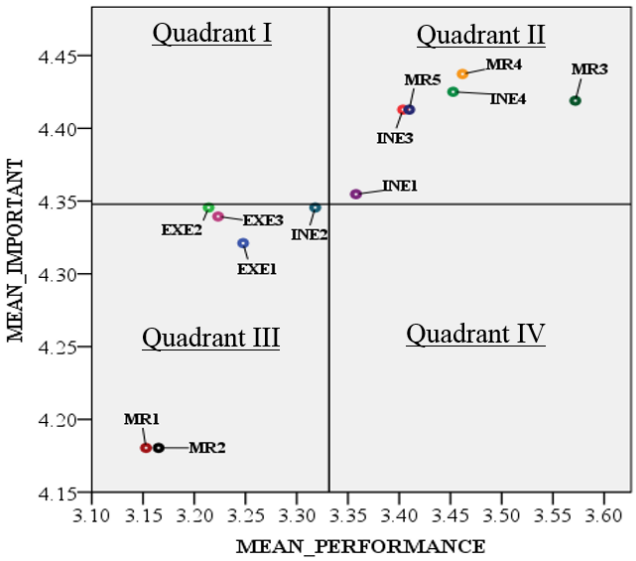


Figure 6.21: IPA Matrix of the Antecedents for the Technology Support Function

Quadrant II (*Keep up the good work*) includes INE1, INE3, INE4, MR3, MR4 and MR5. INE1, INE3 and INE4 partly represent the *Internal Expert* variable. On the other hand, MR3, MR4 and MR5 partly represent the *Monitoring and Review* variable. INE1 is about adequate technical support from IT department, whereas, INE3 is evaluating the adequacy of technical support from the headquarters and INE4 stating that the person in charge at the headquarters are experienced personnel. On the other hand, MR3 is assessing the practice of document inspection, including the checking on AIS related procedures, whereas MR4 is about system audit practice and MR5 concerns evaluating a periodic review on the related manual guideline and SOP. All of the attributes that are found in this quadrant (i.e. Quadrant II) indicates highly important antecedents with high performance.

In contrast, EXE1, EXE2, EXE3, INE2, MR1 and MR2 are found in Quadrant III (*Low priority*). EXE1, EXE2 and EXE3 represent external expert (i.e. vendor/consultant) support towards the technology capability related to the AIS.

Specifically, the attributes are external expert provides adequate technical support, external expert understands the organisation's requirements and the expert personnel are experiences. However, these attributes are perceived less important and also have low performance. On the other hand, INE2 is one of the measures for the *Internal Expert* variable in terms of prompt feedback from the IT department. Similarly, this attribute is suggested as a low priority area. Further, MR1 and MR2 are part of the measures for the *Monitoring and Review* variable. MR1 concerns a practice of comparing the system used in the Government with other developing countries to ensure the current system is not outdated or obsolete. Similarly, MR2 is about a practice of comparing the current system in the Government with other developed countries to encourage the improvement of the system. Both practices (i.e. comparison with other developing and developed countries) are reported to have low performance; at least below the average level.

6.9 SUMMARY

This chapter has discussed the quantitative part of this study. The instrument of this quantitative study was developed based on the qualitative findings and the literature review. It aims to investigate the phenomenon of the critical factors of AIS effectiveness on a larger scale by conducting a survey on the system's users. AIS effectiveness is measured based on user satisfaction level towards the criteria of an effective system. Interestingly, this quantitative study examines and provides statistical support for the comprehensive research model that explains the phenomenon.

In addition, this chapter has explained the implementation of the quantitative study according to the research designed for this study. Implementation of the survey, including data collection, data examination and the survey respondents' descriptive statistics were presented accordingly. Further, the research model of this study is analysed based on the PLS-SEM method using smartPLS software. The research model was analysed in three stages: (i) The main research model – measuring the dimensions in AIS effectiveness as three separate dependent variables; (ii) The final research model – measuring the AIS effectiveness as one dependent variable; (iii) The final research model with a moderator. The analysis confirmed that the research model is reliable and valid for statistical analysis.

Concerning the analysis results, the critical factors (i.e. user commitment and technology support function) are found to have significant positive relationships with AIS effectiveness. The combination of system quality, information quality and benefit/usefulness of AIS to constitute the AIS effectiveness are statistically supported. The results found that the three dimensions of AIS effectiveness are valid and reliable in measuring the AIS effectiveness through HCM analysis. Moreover, teamwork is found to positively affect the relationship between user commitment and AIS effectiveness. On the other hand, knowledge and top management support are statistically supported as the antecedents for user commitment towards AIS effectiveness. In addition to that, internal experts, external experts and monitoring and review activities are statistically supported as the antecedents for technology support function towards the AIS effectiveness.

Furthermore, the quantitative analysis of this study also examined the significant differences between groups. The groups were categorised based on

organisation characteristics (i.e. size of ministry and the background of department) and individual characteristics (i.e. qualification of educational background and education level).

Additionally, the performance gap of each critical factor and its antecedents were investigated accordingly using an IPA matrix. The result suggested the importance-performance gap of each factor in the investigated phenomenon for management and AIS users to be concerned with. The summary of performance gap analysis is presented in Table 6.18.

Table 6.18: The Summary of IPA Result for the Importance-Performance Gap

Area and Description
1). Area to focus:
i. Up-to-date hardware and software.
ii. Strong data protection technology and back-up.
iii. Integration between systems in the government (i.e. GFMAS integrated with other e-Government systems).
iv. Effective communication between levels of management.
v. Transfer of knowledge from internal expert to other AIS users.
vi. Manager/supervisor encourages employees to attend training.
vii. Top management appreciate and utilise the information produced by AIS.
viii. Top management encourages the improvement of AIS.
2). Area to maintain;
i. There is a good relationship between AIS users in the accounting office.
ii. There is a good relationship between accounting office and other departments within the organisation (i.e. ministry).
iii. There is a high cooperation among AIS users within the Government.
iv. Compliance with SOP, policies, standards, rules and regulations.
v. Appreciative and supportive environment towards technology enhancement.
vi. Open door policy to encourage employees to seek for advice, offer suggestions and actively exchange ideas.
vii. IT department provides adequate technical support.
viii. The headquarters (i.e. the AGD) provides adequate technical support
ix. The person in charge at the headquarters (i.e. the AGD) is experienced.
x. Performing inspection (*naziran*) of documentation and procedure.
xi. System audit (system check) in order to ensure the system operates as required with a strong internal control and security.
xii. Periodic review on the manual guideline and SOP of AIS to ensure any changes made to the system are documented and updated accordingly.

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Area and Description
3). Over performed area: i. Prioritise the use of AIS. ii. Actively involved in the decision-making process (i.e. within group, department or in higher level of management). iii. AIS user has an academic qualification in accounting or finance (with basic accounting). iv. AIS user has experience in accounting and the system.
4). Low priority area: i. AIS user understands the function and processes in AIS. ii. Vendor/consultant provides adequate technical support. iii. Vendor/consultant clearly understands the organisation's (i.e. ministry and the Government) requirements. iv. Vendor/consultant is experienced. v. IT department gives prompt feedback. vi. Comparing the current AIS with AIS in other developing countries to ensure that the system in use is not outdated or using obsolete technology. vii. Comparing the current AIS with AIS in developed countries to encourage improvement of the system.

Having considered the qualitative and quantitative findings of this study, the next chapter discusses the findings. The discussions are presented according to the research questions to provide further insight on investigating the scope and context of this study.

CHAPTER 7: DISCUSSION OF FINDINGS

7.1 INTRODUCTION

The results obtained from the qualitative and quantitative analyses of this study have offered some insight into the phenomenon of the critical factors of the AIS effectiveness. This chapter presents the discussion of the results obtained. This study was conducted within the context of the Malaysian Federal Government. It focuses on an on-going and stable system that is currently used by the Government. The scope of this study was concerned with the process function of the AIS. The process function is a stage where the recorded data is processed into valuable information. This covers the tasks of retrieving, sorting, reconciliation and transformation of the data into information.

7.2 DISCUSSION OF RESULTS

Previous studies had discussed and applied various ways in measuring information system or AIS effectiveness. Effectiveness is viewed as the effect of success. In the context of AIS, the system effectiveness conceptually refers to a successful system that meets its users' requirements. Given the concept of meeting the system's users' requirements, a *user satisfaction* measure is popularly used in the literature to assess system success (DeLone and McLean, 2003, 1992), as well as system effectiveness.

Nevertheless, despite its popularity, the use of *user satisfaction* as a single measure has been argued to be insufficient to assess system effectiveness and success (DeLone and McLean, 2003; Gable et al., 2003). Moreover, the variety of system effectiveness's measures have led to an inconsistency of the measurement and

created difficulties in comparing the findings between studies, including the studies in AIS. Furthermore, there are too many factors reported by previous studies as having an influence on information systems as well as AIS. Mixed findings on the factors that significantly influence the AIS and its effectiveness are reported in the literature.

In addition, most of the previous studies focused on the adoption and implementation of the system. Interestingly, this study investigates the current on-going and stable AIS. In specific, the AIS effectiveness is focused on the process function in the system (i.e. processing data into information). One of the system's users mentioned the quality of data, in which "garbage in, garbage out" or vice versa. This referred to the data input and the output (i.e. information). This issue is more likely can be managed by having an effective process function in between the input and the output. As the process function in AIS works to retrieve, check, query, verify, reconcile and transform the data into information, errors in the data can be identified and minimised at this stage. Hence, by effectively processing the 'garbage in' will allow a correction on the data error and may result in good information. Given the importance of AIS in assisting the accounting functions and providing support for decision-making, this study is conducted to answer the following questions in order to achieve the previously mentioned objectives;

Research Question 1: What are the criteria of AIS effectiveness?

Research Question 2: Which of the identified criteria are reliable and valid to measure the AIS effectiveness?

Research Question 3: What are the important factors that lead to an effective AIS? Which of the factors are critically important for the effectiveness of AIS?

Research Question 4: Which of the identified factors are significantly influencing within the phenomenon of the critical factors of AIS effectiveness?

Research Question 5: What is the condition of the gap between perceived importance and perceived performance on the identified factors within the phenomenon of the critical factors of AIS effectiveness in the Malaysian Federal Government?

Particularly, *Research Question 1* and *Research Question 3* were answered according to the findings from the analysis of the qualitative data of this study and the literature review. *Research Question 2* and *Research Question 4* were answered following the quantitative findings of this study. Further, the Importance-Performance Analysis (IPA) matrix was used to answer *Research Question 5*.

7.2.1 Discussion of the Criteria and Measurement for AIS Effectiveness – *Research Question 1* and *Research Question 2*

The AIS effectiveness in this study is defined as a successful system that meets its user's requirements and is capable of satisfying them. Therefore, the criteria of an effective AIS are discussed according to the criteria that are required by the system's users. The AIS effectiveness criteria are then measured based on user satisfaction scale. The used of user satisfaction scale to measure the effectiveness assumes high

satisfaction equal to high effectiveness. This assumption reflects the conceptual definition of system effectiveness in which an effective system is the system that able to meet its users' requirements and satisfying them. However, meeting only some dimensions of AIS effectiveness that proposed in this study might not accurately reflect the system effectiveness. Users' satisfaction towards all dimensions should be achieved, in order to reflect overall effectiveness of the system. The qualitative findings of this study presented a comprehensive measure of AIS effectiveness according to three dimensions: system quality; information quality; and benefit/usefulness of the system.

In detail, system quality in this study is reflected by ease of use, fast processing and capability of the system to produce reports as required by its users. Previous studies listed various criteria of system quality: accessibility, system activity and function, alignment with needs and requirements, smooth procedure and operation, integration, standard and security of system (Rahayu, 2012); system features, function, response time and system reliability (Ismail, 2009); system flexibility, accuracy of data, easy to use and learn, reliable, allow data integration and customisation, efficient, good features, integration with other systems and meet users' requirements (Ifinedo and Nahar, 2006); and ease of use, functional, reliable, flexible, quality of data, portable, integrated and importance (DeLone and McLean, 2003). However, simply adopting these criteria may result in inaccurate measures because they will not always fit all situations and contexts. For example, the integration between systems in the AIS may not always suitable to measure the system quality. Instead, it might be one of the factors that lead to system quality, such as fast response time. Therefore, the findings of this study have refined the

criteria of the system quality through an understanding of the phenomenon by inquiring the AIS users' opinions and analysing both the qualitative and the quantitative data. According to Ives et al. (1983), the system's users' opinions reflect the reality of the system.

On the other hand, information quality is commonly reflected by the characteristics of good information. The information quality in this study is represented by accuracy, completeness and relevancy. These criteria are the most common information characteristics used by prior researchers (e.g. Fitriati and Mulyani, 2015; Rapina, 2014; Komala, 2012; Rahayu, 2012; Dehghanzade et al., 2011; Ismail, 2009; DeLone and McLean, 2003) to represent the quality of information. Moreover, the information quality characteristics are also among the popular measures of system effectiveness. This is because one of the main objectives of AIS is to provide information for decision-making process. In the context of this study, further refinement on the characteristics of information quality has been done in order to reflect the reality of high quality of information according to the system users' opinions. This does not mean that the other information characteristics (e.g. ease of understanding, reliability and consistency) have been neglected and presumed as unimportant. But some of the characteristics can be redundant from a general perspective. For example, in general, information should be reliable and timely in order to be relevant. Outdated and unreliable information, in most circumstances, is not relevant for the decision-making process. In other words, the criterion of relevant information includes timeliness and reliability.

Apart from the system quality and the information quality, gaining benefits from an AIS is also one of the objectives of having the system in place. The

benefit/usefulness of the system in this study is reflected by the improvement of individual productivity, enhancement of the decision-making process, minimisation of unintentional error and encouraging online report submission (i.e. reducing the use of paper). This finding is consistent with the purpose of the AIS as discussed in the literature. Lim (2013) asserted that technology applications have improved the accounting systems and provided effective ways of performing the accounting process. In a more specific context, previous studies discussed the benefits of having an information system or AIS in terms of improving user's performance (Seddon, 1997), enhance productivity (Myers et al., 1997; Seddon, 1997), reduce cost through paperless reporting (Lim, 2013; Myers et al., 1997), support planning and controlling activities (Kharuddin et al., 2010), effectively manage organisation's business activities (Dalci and Tanis, 2009), improve accounting operations (Ilias and Zainudin, 2013) and speeding up the production of accounting information (Sacer and Oluic, 2013). Besides, the capability of technology applications allows an automation of some processes in accounting, which subsequently minimised human error (Lim, 2013).

Nevertheless, benefit/usefulness of the system is not popularly applied criteria in the measurement of information systems or AIS effectiveness in previous studies. This might be because of the perspective towards the benefit/usefulness of the system varies from one user to another. The benefit/usefulness depends upon the intentions of the AIS users using the system, as well as their usage of the system. For example, a user that uses the system for data retrieving to support the decision-making process may be concerned about the benefit in terms of improvement in the decision-making process. On the other hand, a user who uses the system to process

accounting information may be particular about the capability of the system to improve the accounting work flow. Therefore, the findings of this study were used to refine the benefit/usefulness of AIS from a general point of view, within the scope of process function of the system. In summary, the detail dimensions and criteria of an effective AIS is shown in Table 7.1. This finding answers *Research Question 1* of this study about the criteria of AIS effectiveness.

Table 7.1: A Comprehensive Measure of AIS Effectiveness

Dimension		Item	
1)	System Quality	i.	The system is easy to use (user friendly).
		ii.	The processing time (i.e. speed) of the system.
		iii.	The system is able to produce report in a required format.
2)	Information Quality	i.	The information is accurate (no doubt).
		ii.	The information is complete (all transactions are captured accordingly).
		iii.	The information is relevant for use in decision making.
3)	Benefit/usefulness of AIS	i.	The system improves individual productivity.
		ii.	The system improves the decision-making process.
		iii.	The system minimises unintentional human error.
		iv.	The system reduces hard copy submissions (paperless).

Further analyses were performed on the reported criteria to statistically test the reliability and validity of each criterion to proxy the effectiveness of AIS. The statistical results of this study found all of the identified criteria are reliable and valid to measure the system effectiveness based on a user satisfaction scale.

In particular, the *processing time (i.e. fast response)* and *complete information* appear to be the strongest predictors for system quality and information quality, respectively. The information quality is also found to be highly represented by the *accuracy of information* produced by the system, right after the criterion of

complete information. On the other hand, the *benefit/usefulness of the system* is found to be highly reflective of the *improvement in decision-making process*. Concerning the result of Hierarchical Components Model (HCM) analysis, *information quality* appears to be among the strongest predictors for the AIS effectiveness. This is consistent with the literature about the popularity of information quality as a measure for information system, as well as AIS effectiveness. The second strongest predictor of AIS effectiveness is *system quality*, followed by *benefit/usefulness of the system*.

Furthermore, these three dimensions (i.e. *information quality*, *system quality* and *benefit/usefulness of the system*) are consistent with the objectives of AIS, which are to assist in accounting functions and to provide accounting information. The reliability and validity of these dimensions have been statistically confirmed by HCM analysis results. **Thus, this study found that the *system quality*, the *information quality* and the *benefit/usefulness of the system* are reliable and valid to constitute the measurement of AIS effectiveness. The three dimensions comprises of 10 reliable and valid criteria of AIS effectiveness that are measured based on a user satisfaction scale.** This finding answers *Research Question 2* of this study about the reliable valid criteria of AIS effectiveness.

7.2.2 Discussion of the Phenomenon of the Critical Factors of AIS Effectiveness – *Research Question 3* and *Research Question 4*

Critical factor is an important key component which, if properly managed, will enable the effectiveness of the AIS. Nevertheless, literature reported too many factors influencing the information system, including the AIS. In addition, empirical

evidence about the mix findings of the significant factors influencing the AIS and its effectiveness were found in previous studies (Chalu, 2012; Choe, 1996). According to Chalu (2012) and de Guinea et al. (2005), the researchers' effort to develop a list of factors that greatly influence the information system or the AIS effectiveness, remains on-going. The struggle to build the key factors influencing the system's effectiveness may be due to variation in concept and definition of system effectiveness between studies. This has led to difficulty in comparing findings between studies.

In spite of that, the mixed findings may also be caused by a lack of strong justification for the context of study, the scope and the sample selection. In particular, the different stages of the system evolution (e.g. adoption, early implementation and a stable system) may have different factors affecting the system (Choe, 1996). In consistent with that, Cinquini and Mitchell (2005) summarised that the conceptions and determinants of ABC/M system are varies according to the different stages of the system development. For example, top management support may be critically needed during the adoption stage of the system, but may not be critically needed when the system's operations reach its stability.

As such, the qualitative fieldwork of this study plays an important part in enlightening the understanding of the phenomenon of the critical factors of AIS effectiveness. Further, the quantitative study provides a supplementary analysis towards the qualitative findings and strengthens the findings of this study. This study is conducted on the on-going and stable AIS that covers three main accounting systems: GFMAS; *eSPKB*; and *eTerimaan*.

Interestingly, the findings of this study highlighted the importance of the main components of AIS towards the system effectiveness: people; technology; process; and structure. Overall, nine factors are proposed in the research model of this study, as having influence within the phenomenon of the critical factors of AIS effectiveness. **The factors are *user commitment, technology support function, teamwork, knowledge, top management support, culture, internal expert, external expert,* and *monitoring and review***. **It is found that the system *user commitment* and *technology support function* towards the AIS are the critical factors of AIS effectiveness**. On the other hand, **the process and structure, which are represented by *teamwork*, are found to significantly strengthening the relationship between *user commitment* and *AIS effectiveness***. However, the other factors are found to be the antecedents of the critical factors of AIS effectiveness. Specifically, ***knowledge* and *top management support* are the antecedents for *user commitment* towards the effectiveness of AIS**, whereas, ***internal experts, external experts,* and *monitoring and review* are the antecedents for *technology support function* towards the system effectiveness**. Nevertheless, the result reported **the insignificance of *culture* to influence the system's users' commitment towards the AIS effectiveness**.

i. Discussion of the Critical Factors of AIS Effectiveness

Above all of the factors influencing the AIS that have been discussed in previous studies, most are associated with the adoption or implementation of a system. Some studies investigate the system effectiveness in a more specific context, such as human characteristics, or in general context, such as technological environment

aspects. The mixed findings on the factors affecting the AIS performance and effectiveness reported in the literature may be due to different stages of the system's evolution that is being studied, organisation types and environment reasons such as culture and structure. Choe (1996) found the influencing factors of the AIS performance vary between the prior stage (e.g. adoption and expansion) and the posterior stage (e.g. implementation and development).

Practically, a newly adopted system needs involvement from various parties (e.g. top management, internal and external expertise, middle and lower management) in order to design and develop a good system that meets the organisation's requirements. However, for a stable and on-going system, the system is directly interacting with its users. These users are supported by technology through several processes being set up in the system, in order to complete a particular activity. Therefore, **the finding of this study highlighted the importance of *user commitment* and *technology support function* as the critical factors of *AIS effectiveness***. This finding answers *Research Question 3* of this study about the important factors that lead to an effective AIS and the critical factors of AIS effectiveness. **Further analysis found that both factors (i.e. *user commitment* and *technology support function*) significantly influence the effectiveness of AIS**. The finding responds to *Research Question 4* about the significant factors influencing the AIS effectiveness.

User Commitment

User commitment in this study refers to a user's dedication that is presented by his or her efforts towards the performance of the AIS. The importance of user commitment

highlighted in this study is consistent with prior studies' findings and discussions. Iskandar (2015) and Rapina (2014) found management commitment influences the AIS quality. Further, investigating based on another perspective of commitment; several studies found organisational commitment has an impact on the AIS success (Fitriati and Mulyani, 2015) and AIS quality (Indahwati, 2015; Syaifullah, 2014).

In particular, this study views commitment in terms of system usage and user involvement. This view is consistent with the concept of system usage as an enabler for system benefit (Myers et al., 1997) and leads to user satisfaction (DeLone and McLean, 2003). System usage has been applied in various information systems and AIS research models. Nevertheless, given the multidimensional concept of AIS effectiveness, some criteria in the system effectiveness have been discussed in terms of its impact on user intention to use the system (DeLone and McLean, 2003), user attitude towards using the system (Davis, 1985) as well as organisation intention to adopt the system (Greenberg et al., 2012). Specifically, system quality and usefulness perceived by the system's users lead to their intention and attitude towards using the system. Similarly, perceived usefulness of the system leads to organisation intention to adopt the system (Greenberg et al., 2012). However, these impacts are referring to adoption and early implementation stage of the system. As for an on-going and stable AIS, the qualitative findings of this study suggested that user commitment influencing the system effectiveness. This finding is consistent with the quantitative finding and previous studies (e.g. Iskandar, 2015; Rapina, 2014; Fitriati and Mulyani, 2015; Indahwati, 2015; Syaifullah, 2014).

Furthermore, the context of the system usage has also been debated by previous researchers in terms of its voluntary and mandatory use. Logically, a

committed user is less likely to be affected by the condition of a voluntary or mandatory use of the system. Thus, applying user commitment as a construct in the research model can overcome the issue of a survey respondents' bias response towards the system usage caused by mandatory use. Moreover, the committed AIS users will have more courage to voice their opinions and get involved in the decision-making process. Therefore, compliance on rules and regulations, prioritising the use of AIS and active involvement in decision-making best reflect committed AIS users, regardless of whether the system is used on a voluntary or mandatory basis. Fitriati and Mulyani (2015) stated that highly committed employees commonly performed at their best to operate any systems in their organisation.

As a result, this study found that user commitment significantly influences all dimensions of AIS effectiveness: system quality; information quality; and benefit/usefulness of the system. In a specific analysis, user commitment is highly influential of the quality of information, followed by the benefit/usefulness of the system and the system quality. Nevertheless, differences in opinions between the AIS users cannot be avoided in practice. Further investigation found that the AIS users at the accounting office highly perceived the significance of user's commitment in order to gain the benefit and usefulness of the AIS, as compared to the users at the responsibility centre. In addition, the AIS users with a diploma education level or lower strongly perceived the importance of user's commitment towards the information quality, as compared to the system's users with a degree education level or higher. The differences between the AIS users' opinions are led by their job scope, nature of usage and expectation of the outcome from the system. Based on the analysis result of the AIS effectiveness, there is no significant difference found

amongst the AIS users when the dimensions in AIS effectiveness are combined into one dependent variable. The result indicates a consistency in the AIS users' opinion about the importance of user commitment towards AIS effectiveness.

Therefore, this study concludes that ***user commitment*** **is crucially needed for the AIS effectiveness, in which the higher the user's commitment towards the AIS, the more effective the system will be**. In particular, *user commitment* refers to: **compliance on rules and regulations; prioritising the use of the system; and involvement in decision-making activities**. This finding responds to *Research Question 3* and *Research Question 4* about the important and significant factors within the phenomenon of the critical factors of AIS effectiveness.

Technology Support Function

Technology support function refers to the capability of technology functions to support the AIS operations. This study found the technology support function significantly influences the effectiveness of AIS. A well-functioning technology to support the AIS is viewed according to: up-to-date hardware and software; strong data protection technology and back-up; and integration between systems in the Government. The importance of the technology support function reported in this study is consistent with the literature.

Up-to-date hardware and software is crucial in order to achieve the effectiveness of the AIS, especially with an increasing number of accounting transactions and rapid changes in the technology. This finding is consistent with the role of the modern technology in contributing to the quality of the AIS (Sacer and Oluic, 2013). A study by Taber et al. (2014) found that software and hardware

significantly influence the AIS efficiency. Discussed in wider context about the information system infrastructure, Indahwati (2015) reported that the infrastructure influences the AIS quality. Obviously, the need for technology to support today's AIS is undeniable, especially for big organisations such as the government.

Apart from the need for technology to support the daily operations, technology is also designed to provide control and security functions, as part of internal controls, throughout the accounting process. Saeidi et al. (2014) asserted that an internal control is crucially needed in order to ensure the quality of accounting data. Rapid changes in the technology not only bring benefits, but also threats and risks (e.g. data theft). Therefore, a strong internal control is crucial in order to minimise the risk, especially in a highly technological environment (Sacer and Oluic, 2013).

Moreover, technology enables the achievement of better performance through the enhancement of the productivity of accounting information (Sacer and Oluic, 2013), by decreasing the time consumed for financial report preparation (Ramazani and Allahyari, 2013). However, Kouser et al. (2011) and Ismail (2009) reported an insignificant relationship between the AIS sophistication and the AIS effectiveness. The AIS sophistication in their study refers to the number of accounting applications in place, such as general ledger, billing, payroll, budgeting etc. Greater application installation represents higher sophistication of the AIS. Technically, having several accounting applications requires an integration feature between the applications, in order to achieve effectiveness of the AIS. Thus, measuring the integration feature between the related systems is found to be more accurate in representing the capability of technology towards the achievement of the AIS effectiveness. This is

consistent with previous studies' findings, in which the sophisticated feature of technology has enhanced the relevancy and reliability of the accounting information (Alzoubi, 2011) and subsequently improved the quality of information (Sacer and Oluic, 2013).

Based on the statistical result of this study, the technology support function is found to have a significant influence on system quality, information quality and benefit/usefulness of the system. The result implies the importance of the technology support function towards all dimensions of AIS effectiveness. Specifically, the technology support function strongly influences the benefit/usefulness of the system, followed by the information quality and the system quality. In addition, further analysis found that the AIS users at the responsibility centre firmly believed in the importance of the technology support function in realising the benefit/usefulness of the system, as compared to the users at the accounting office. This is consistent with the finding about the AIS users at the accounting office strongly perceived the importance of user commitment towards the realisation of the benefit/usefulness of the system. However, the AIS users' opinions are found to have no significant differences when all dimensions of AIS effectiveness are combined into one variable. The result implies consistent opinions amongst the AIS users about the importance of the technology support function towards overall effectiveness of the system.

As such, this study concludes that the ***technology support function*** **is a critical factor of** ***AIS effectiveness***. This study found that **a high performance of technology in facilitating the AIS leads to the system effectiveness**. Specifically, the *technology support function* is viewed in terms of: **up-to-date hardware and software; strong data protection and back-up; and integration between systems**.

This finding answers *Research Question 3* and *Research Question 4* about the important and significant factors within the phenomenon of the critical factors of AIS effectiveness.

ii. Discussion of the Antecedents for User Commitment towards AIS Effectiveness

This study suggests *knowledge*, *top management support* and *culture* as the antecedents for the user commitment towards AIS effectiveness. However, only *knowledge* and *top management support* that are found to have significant positive influence on user commitment.

Knowledge

The importance of knowledge towards an information system and AIS has been asserted in many studies. Several studies found a significant relationship between knowledge and AIS (Komala, 2012; Wiechetek, 2012; Kouser et al., 2011; Ismail, 2009). However, the qualitative findings of this study suggested *knowledge* as an antecedent for *user commitment* towards the AIS effectiveness. In addition, *knowledge* is statistically found to have a significant positive relationship with *user commitment* towards the AIS effectiveness. This finding confirmed the earlier finding in the qualitative part of this study about the importance of knowledge within the phenomenon of the critical factors of AIS effectiveness.

Practically, knowledge needs to be applied in order to get an outcome from it. Knowledge is often discussed as having an impact on system usage. Awosejo et al. (2013) suggested that the enhancement of system user's knowledge is important for

better utilisation of the AIS. However, insufficient knowledge among the AIS users is one of the challenges in the AIS field (Appiah et al., 2014). In practice, the AIS users have to be equipped with adequate knowledge in order to gain benefits from the system (Agung, 2015). The impact of knowledge on the system usage is also mentioned by Pierre et al. (2013), in which an inadequacy of knowledge may cause inefficiency of the AIS usage.

Knowledge in this study is reflected by the AIS users': **academic qualification (i.e. in accounting or finance that has basic accounting knowledge); experience in accounting and the system; and understanding of the function and process in the system**. In response to *Research Question 3* and *Research Question 4* of this study about the important and significant factors within the phenomenon of the critical factors of AIS effectiveness, ***knowledge* is found to be the antecedent for *user commitment* towards the *AIS effectiveness***. Specifically, **the AIS user that has a high level of knowledge is found to be highly committed towards the effectiveness of AIS**.

Top Management Support

In the literature, top management has been extensively discussed as an influencing factor of information systems, as well as AIS. Rahayu (2012) stated that top management's commitment has an impact on the enhancement of the AIS. Similarly, Komala (2012) reported that top management support has a significant influence on the AIS. In a wider context, top management support is said to be one of the critical factors for IT service management implementation (Zhang et al., 2013), IT and

information system implementation (Aziz et al., 2012), ERP adoption (Ngai et al., 2008) and ERP implementation (Nah and Delgado, 2006).

However, Kouser et al. (2011) and Ismail (2009) found manager participation in the AIS implementation does not significantly influence the system's effectiveness. Consistent with that, Saleh (2013) found an insignificant relationship between the top management's commitment and data quality in the AIS. This might be explained by the scope of the system usage within the top management level. Basically, top management is more involved with decision-making than operations. Thus, they are less frequently using the system to process data. Instead, their usage is more for retrieving the information. This phenomenon can be demonstrated by the finding of Saleh (2013), in which middle management's commitment significantly influenced the quality of data in the AIS.

Therefore, in the context of this study for stable and on-going AIS, ***top management support*** **is found to be the antecedent for** ***user commitment*** **towards the system's effectiveness**. Further analysis noted a significant difference on the result of the relationship between the AIS users that have an education qualification solely in accounting, as compared to the users that have mixed (i.e. accounting and other fields of educational background) or non-accounting qualification of educational background. The result reported that the first group strongly perceived the importance of top management support in order to encourage the system's users' commitment towards the AIS effectiveness, as compared to the latter group. In response to *Research Question 3* and *Research Question 4* about the important and significant factors within the phenomenon of the critical factors of AIS effectiveness, this study concludes that **strong support from the top management leads to a high**

commitment amongst the system users towards the achievement of AIS effectiveness. The *top management support* is viewed in terms of: **encouraging employees to attend training; appreciating and utilising the information produced by the AIS; and encouraging the improvement of the system**.

Culture

Culture in this study refers to cumulative shared values and the way of working embedded in the organisation's practice. In particular, the perceived performance of culture is rated according to appreciative and supportive environment towards technology enhancement, open door policy and a transfer of knowledge from the internal expert to the AIS users. Several studies (e.g. Aziz et al., 2012; Wiechetek, 2012) mentioned culture as a critical factor influencing the information system implementation. Further, Fitriati and Mulyani (2015) found a significant positive relationship between organisational culture and the AIS success. Practically, a good culture helps in achieving the system success.

However, in the scope of system effectiveness for a stable and an on-going system, culture is most likely affecting the people that use the system. Furthermore, the qualitative result of this study proposed culture as the antecedent for user commitment towards the AIS effectiveness. The finding is consistent with the concept of culture discussed by Nongo and Ikyanyon (2012, p. 1), in which they stated that 'corporate culture affects the way in which people behave in an organization'. Specifically, a supportive culture that encourages employee's capability to adapt any changes in an environment is found to improve their level of commitment (Nongo and Ikyanyon, 2012).

Nevertheless, the earlier finding from the qualitative fieldwork is not supported by the statistical analysis result of this study. The result found that culture does not significantly influence the effectiveness of AIS. The reason behind this finding may be because the impact of culture is broader than just on the employees' commitment towards the AIS. The consequences of culture are intangible and limitless, in which the positive impact of culture may also affect the other aspects of the employees, such as their loyalty, happiness and skills. Therefore, this study concluded that ***culture*** **does not significantly influence the system's users' commitment towards the AIS effectiveness**. This finding answers *Research Question 3* and *Research Question 4* about the important and significant factors within the phenomenon of the critical factors of AIS effectiveness.

iii. Discussion of the Antecedents for the Technology Support Function towards AIS Effectiveness

The qualitative findings of this study propose *internal experts*, *external experts*, and *monitoring and review* activities as the antecedents for technology support function towards the AIS effectiveness. Further, the quantitative analysis found all proposed antecedents significantly influence the *technology support function*.

Internal Expert

Internal expert in this study refers to a group of people from the headquarters (i.e. the AGD) and each ministry that provide support towards the AIS technical matters. This includes the support for accounting and technology matters.

This study found a positive significant relationship between the *internal expert* and the *technology support function* towards the AIS effectiveness. In other words, strong support from the internal expert will result in a greater technology capability for supporting the AIS and leads to the system's effectiveness. Pitt et al. (1995) stated that the information system department's support for the system's related matters is crucial because the system's users are relying on them if there are any technological or system related issues. In practice, it is rare to have accounting personnel that have a deep knowledge in technical IT matters. Commonly, their understanding of the system is limited to the general function of the system and the specific function that is related to their job scope. Any technical problems that occur within the system (e.g. server error, hardware and software malfunction etc.) will be referred to internal expert for assistance. Zhang et al. (2013) found that IT personnel's ability and participation are crucial towards the IT service management implementation.

Nevertheless, the importance of internal expert towards the AIS effectiveness is not popularly discussed in the literature. This may be caused by the indirect impact of internal expert on the AIS effectiveness. In addition, most of the prior studies focused on Small and Medium-Sized Enterprise (SME). It is common to hear about 'a lack of in-house expertise in developing information system' (Mitchell et al., 2000, p. 3), a lack of IT department availability among the SME and some of them do not even have an IT department (Medina-Quintero et al., 2015). They commonly outsource their system's development and maintenance. For certain technical issues that occur after the implementation of the system, the appointed external expertise (i.e. vendor and consultant) will be referred to. Furthermore, some of the accounting

software offers a full package, including installation, maintenance and consultation. This had minimised the reliance on the internal expert.

However, in the context of a large organisation, such as the government, the internal expert plays a crucial role towards the AIS in terms of providing their knowledge and skills related to accounting and technology matters. Specifically in this study, ***internal expert*** **is found to be the antecedent for the** ***technology support function*** **towards** ***AIS effectiveness***. The result reported that **strong support from** ***internal expert*** **leads to a stronger technology support function for an effective AIS**. In particular, the *internal expert* is represented by: **adequate support from the IT department and the headquarters (i.e. AGD); prompt feedback from the IT department for any issues raised; and the personnel at the AGD are experienced to deal with the raised issues**. This finding answers *Research Question 3* and *Research Question 4* about the important and significant factors within the phenomenon of the critical factors of AIS effectiveness.

External Expert

External expert in this study refers to a vendor or a consultant. A vendor is an outside organisation that is appointed to install the AIS package (i.e. software, customisation of the system, training etc.) and work together with the accounting and IT personnel from the Government, to design and develop the system. On the other hand, a consultant is an outside organisation that is appointed to give advice on the accounting and AIS-related matters.

The *external expert* in this study is found to have a significant positive relationship with the *technology support function* towards the effectiveness of AIS.

The result implies that strong support from the external expert enhances the technology support function towards the AIS effectiveness. However, Ismail (2009) stated that the maturity of IT and a user-friendly AIS package can lead to less reliance on the consultant. Consistent with that, Chalu (2012) found the availability of the consultant does not significantly influence the effectiveness of AIS when their recruitment is based on the central organisation's decision and the organisation has its own internal expert. Contradictorily, Ifinedo and Nahar (2006) asserted that the complexity of the system in a large organisation might lead to an external expert being needed. Furthermore, studies conducted by Ismail (2009) and Thong et al. (1996) reported that vendor has a significant influence on the AIS. In a wider context of ERP, Daoud and Triki (2013) confirmed that external expert has an impact on the system quality. In addition, several studies have discussed the importance of external expert towards ERP adoption (Ngai et al., 2008), implementation (Ram and Corkindale, 2014; Shaul and Tauber, 2013; Doom et al., 2010) and upgrade (Nah and Delgado, 2006).

The mixed findings reported in the literature may be caused by the different between stages of the system that were studied. Based on the literature, most of the researchers agreed that external expert is important during the early stage of system development and implementation. However, as the system reaches its maturity and its users become familiar with the system operations, the external expert might no longer be needed. Nevertheless, their service might still be needed to solve any technological problems related to the system. This is because no matter how good the system's users are, there are always areas that require a technical expert, especially

for particular technology issues. Some issues that cannot be solved by the internal expert will need to be forwarded to another expert, such as an external expert.

Therefore, this finding is in response to *Research Question 3* and *Research Question 4* about the important and significant factors of the critical factors of AIS effectiveness. This study concludes the importance of ***external expert*** **as the antecedent for the *technology support function* towards AIS effectiveness**. In detailed analysis, different education levels amongst the AIS users is found to generate different opinions towards the result. Specifically, system's users with a diploma level or lower highly perceived the importance of *external expert* as the antecedent for *technology support function* towards the system's effectiveness, as compared to users with a degree education level or higher. The *external expert* is viewed in terms of: **adequate technical support from the vendor/consultant; the vendor/consultant clearly understands the organisation's requirement; and the vendor/consultant is experienced**. **Great support from the external expert is found to enhance the technology support function towards the effectiveness of AIS**.

Monitoring and Review

Monitoring and review activities discussed in this study focus on the activities performed towards the technology and the AIS related matters. These activities include benchmarking, inspecting documents and procedures, checking the system and reviewing the related rules and regulations. However, instead of influencing the effectiveness of AIS, this study found the monitoring and review activities have a

positive significant effect on the technology support function towards the AIS effectiveness.

The finding is consistent with other researchers' discussions about the importance of monitoring and review activities towards the system and technology. In the context of an IT project, Imtiaz et al. (2013) and Zhang et al. (2013) stated that monitoring is crucial for the success of the project. Furthermore, several studies (i.e. Shaul and Tauber, 2013; Ngai et al., 2008) in ERP agreed that the activity of reviewing the current system, by making a comparison between the system in place and systems at other organisations, is one of the critical success factors of the ERP. This activity helps to benchmark the status of the current system (i.e. updated or outdated). In addition, the activity ensures the system is strong enough to face risk and threats from rapid changes in technology. Moreover, a periodic review on the related technology is performed to ensure the technology is capable and stable enough to support the AIS. Any changes made to the system should be recorded and updated in the related documents (i.e. SOP and manual guidelines) for the system's user's reference. Sacer and Oluic (2013) asserted that data checking and AIS audits are important in order to ensure the quality of data produced by the system. In practice, not all errors can be detected by the system, especially manual entry errors made by humans. These errors lead to ineffectiveness of the AIS. Therefore, an inspection of the documents, data and procedures help to certify the credibility of the data entered, as well as checking the capability of the technology to process the data in the system.

However, most previous studies discussed the monitoring and review activities for adoption and implementation of the system. As for stable and on-going

AIS, the monitoring and review activities are found to have an influence on the technology support function towards the effectiveness of the system. In response to *Research Question 3* and *Research Question 4* about the important and significant factors within the phenomenon of the critical factors of AIS effectiveness, this study concludes that ***monitoring and review*** **is the antecedent for the** ***technology support function*** **towards** ***AIS effectiveness***. **Great performance of the** ***monitoring and review*** **enhances the technology function to support the achievement of AIS effectiveness**. Specifically, the *monitoring and review* is reflected by the activities of: **comparing the current system with developed and developing countries; inspecting the accounting documents, as well as the involved procedures; auditing the system; and periodically reviewing the manual guidelines and the Standard Operating Procedure (SOP)**.

iv. Discussion of Teamwork in AIS

Teamwork in this study associates the processes in AIS and the organisation's structure related to the system. Technically, an AIS is designed to be operated through teamwork, in order to complete the processes needed to produce the required information. Teamwork is represented by communication, relationships and cooperation.

According to the literature, teamwork is said to have a positive influence on the success of IT projects (Imtiaz et al., 2013) and the quality of data (Saleh, 2013). Ifinedo and Nahar (2006) proposed work group impact as one of the measures for ERP system success. However, instead of teamwork influencing the AIS effectiveness, this study found that teamwork influences the relationship between

user commitment and AIS effectiveness. In particular, effective teamwork is found to enhance the impact of user commitment on the achievement of the AIS effectiveness. This finding might be different from previous studies because this study is conducted on a stable and on-going system, whereas, most of the previous studies focused on the adoption and implementation of the system. Moreover, as the processes are attached in the system, the system connects not only people within the accounting department, but also people from other departments within the organisation (Saeidi et al., 2014). Furthermore, working in groups with a high teamwork spirit amongst the team members help to smooth the accounting processes and subsequently placed a greater impact on the AIS effectiveness.

As such, this study concludes that ***teamwork*** **is a moderator between** ***user commitment*** **and** ***AIS effectiveness***. **Good teamwork performance is helpful in enhancing the impact of** ***user commitment*** **on the effectiveness of the AIS**. More specifically, the importance of teamwork in enhancing user's commitment influential power towards the AIS effectiveness is perceived stronger by the AIS users in small ministries, as compared to the users in large ministries. *Teamwork* is reflected by: **effective communication between the levels of management; good relationships between the AIS users in the accounting office; good relationships between the accounting office and other departments within the organisation; and high cooperation amongst the AIS users within the Government**.

On the other hand, the impact of teamwork on the relationship between the *technology support function* and *AIS effectiveness* is found insignificant. In other words, the effectiveness of AIS relies on the capability of technology to support the system regardless of teamwork performance within the users. Thus, this study

concludes that teamwork does not significantly moderate the impact of *technology support function* on *AIS effectiveness.*

These findings answers *Research Question 3* and *Research Question 4* of this study about the important and significant factors within the phenomenon of the critical factors of AIS effectiveness.

7.2.3 Discussion of the Gap between Perceived Importance and Perceived Performance for All Identified Factors – *Research Question 5*

The gap between perceived importance and perceived performance in this study refers to the comparison between both scores. The scores for all factors in the phenomenon of the critical factors of AIS effectiveness are plotted in the IPA matrix. The results are reported according to four conditions based on the AIS users' opinion about the importance versus the performance of each factor: *area to focus (concentrate here)*; *area to maintain (keep up the good work)*; *low priority area*; and *over performed area (possible overkill)*. According to Martilla and James (1977), the differences between importance and performance may be an indicator for dissatisfaction. However, the result of the importance-performance gap is descriptive-based and limited to the AIS users' opinion. Thus, having both the statistic result on the relationship between the examined factors and the importance-performance gap enables a better understanding of the phenomenon. The findings discussed in this section and the following sub-sections answer *Research Question 5* of this study about the condition of the perceived importance-performance gap for all of the identified factors within the studied phenomenon.

i. Area to Focus (Concentrate Here)

The result of this study found several areas that require management's attention for improvement. These areas are perceived as important, but low performance, by the AIS users. In particular, the areas are listed in Table 7.2.

Table 7.2: Area to Focus

Factor	Criteria
Technology Support Function	- Up-to-date hardware and software. - Strong data protection technology and back-up. - Integration between systems in the government (i.e. GFMAS integrated with other e-Government systems).
Teamwork	- Effective communication between levels of management (i.e. top, middle and lower).
Top Management Support	- Manager/supervisor encourages employees to attend training. - Top management appreciate and utilise the information produced by AIS. - Top management encourages the improvement of AIS.

In detail, the respondents believe the criteria of *technology support function* are important for the effectiveness of AIS. However, the performance of these criteria is below the average level of perceived performance. This implies that the present technology is not sufficient to cope with current needs, in order to have an effective system. The advancement of software, hardware, security and technology functions should be balanced accordingly. As discussed with the AIS users during the qualitative fieldwork, they think that some of the hardware, especially in rural areas (i.e. the regional office), need to be replaced or improved in order to effectively use any upgraded software version. The outdated hardware may slow down the accounting operations which subsequently affect the effectiveness of AIS.

Additionally, the respondents perceived that the current technology does not strongly protect the system and its recorded data. They believe the technology security features should be improved in order to secure the process of transforming the accounting data into information. However, this is based on the AIS users' opinion, which may not reflect the actual technical capability of the system. Nevertheless, a good system should be able to make its users feel comfortable with the system's security and data back-up function. One of the interviewees during the qualitative fieldwork mentioned that it will be more convincing if the system was able to show the data tracking changes in the system within the scope of each user. For example, the history log for any transactions made in the accounting receivable account. Moreover, the current security device that is used to access the accounting system is not compatible with technological advancements. Therefore, the upcoming upgraded accounting system will replace the security device, as well as some of the features of the system. This is hoped to overcome the issue of underperforming security systems and data back-up.

Besides, the integration function that connects the data in one system to another is also perceived to underperform, at least below the average level of perceived performance. This may happen because of the different servers that are used by different systems. Moreover, the current accounting system (i.e. GFMAS) is a standalone system. Thus, any problems that occur on any of the system's servers that relate to the accounting system will affect the performance of the integration between the accounting system and the other systems (e.g. human resource system) in the Government.

Similarly, effective communication between the levels of management also underperforms. The AIS users perceived this area as important criteria to strengthen the impact of their commitment on the AIS effectiveness. However, there is a communication gap between the top, middle and lower management levels. This may be caused by the structure in the Government, which has created a gap between the management levels. A large organisation, such as the Government, is highly structured in terms of job position and task allocation. Hence, management should put more efforts in to minimising the gap between management levels, in order to enhance the effect of AIS user commitment on the effectiveness of the system.

Apart from that, the users of AIS believe that top management support is highly important in encouraging their commitment towards the system's effectiveness. Nonetheless, the support from the top management is below the average level of the system's users' expectations. The lack of top management support refers to the scope of: manager/supervisor encouraging their employees to attend meetings; top management appreciation and utilisation of the information produced by the system; and top management encouragement for AIS improvement. This lack of support is consistent with the qualitative findings of this study.

Based on the qualitative findings, there are few cases mentioned by the interviewees where a manager sent personnel that are not fit for the training purpose. For example, training designed for a head of procurement unit was attended by an accounting clerk from that department. This issue is caused by the unavailability of the personnel due to work load or having other urgent tasks to be completed. However, because presence is mandatory, the manager of the department sent the clerk to replace the head of procurement unit in order to make sure training

attendance is fulfilled. The consequence of this problem is waste of a training program and discouragement towards the AIS users' commitment. Statistically, manager/supervisor effort to encourage the right employee to attend the provided training contributes to an increase of the system's users' commitment towards the AIS effectiveness. Nevertheless, improper management may lower the system users' commitment.

In addition, there is a lack of top management appreciation and utilisation of the information produced by the AIS. As one of the system's purposes is to provide information for decision-making and educate the information's users, it would be a waste if top management did not appreciate and utilise the produced information. Furthermore, today's AIS not only records and presents historical information, it is also able to generate a forecast for better consideration during the decision-making process. The lack of top management appreciation and utilisation of the information produced by the AIS also shows top management's lack of concern towards the system. This can discourage the system's users' commitment towards the achievement of an effective system.

Moreover, it is found that top management encouragement for the AIS improvement affects the AIS users' commitment towards the achievement of the system's effectiveness. Most of them agreed that top management encouragement towards the AIS improvement is important. However, the encouraging level of top management towards the AIS improvement is below the system's users' expectations. This condition can affect the commitment level of the AIS users in achieving the effectiveness of the system.

Furthermore, the majority of the AIS users believe that the practice of transferring knowledge from the internal expert to the system's users is perceived to be important but performed below the average level. In the context of the Malaysian Federal Government, the internal expert is either from the IT department of each ministry or the headquarters (i.e. the AGD). Therefore, the transfer of knowledge between the internal expert and the AIS users is mostly performed during a formal program, such as training or meetings. Informal activities to transfer knowledge from the internal to the AIS users are unlikely to happen because of different departments and various locations. Although this cultural criterion is perceived as important by the AIS users, its performance is found to insignificantly affect the system's users' commitment towards the AIS effectiveness. In other words, the culture of knowledge transfer from the internal expert to the AIS users does not affecting the system's users' commitment towards the system's effectiveness.

In summary, the *technology support function* is one of the critical factors of AIS effectiveness. Its performance is important in order to realise the effectiveness of the system. In addition, effective communication between management levels, which is a part of *teamwork*, is found to strengthen the impact of *user commitment* on the AIS effectiveness. On the other hand, *top management support* is found to be the antecedent for *user commitment* towards the AIS effectiveness. Nevertheless, the performance of these areas is below the average level of performance when compared to its importance. Therefore, management should improve these areas in order to have an effective AIS in place and sustain the effectiveness.

ii. Area to Maintain (Keep up the Good Work)

An area to maintain is an area where the tested criteria/factors meet a good condition, in which both the perceived importance and the perceived performance level are above their average levels. Table 7.3 lists the area where performance should be maintained.

Table 7.3: Area to Maintain

Factor	Criteria
Teamwork	- There is a good relationship between AIS users in the accounting office. - There is a good relationship between accounting office and other departments within the organisation (i.e. ministry). - There is high cooperation amongst AIS users within the Government.
User Commitment	- Compliance with SOP, policies, standards, rules and regulations.
Internal Expert	- IT department provides adequate technical support. - The headquarters (i.e. the AGD) provides adequate technical support - The person in charge at the headquarters (i.e. the AGD) is experienced.
Monitoring and Review	- Performing inspection (*naziran*) of documentation and procedures. - System audit (system check) in order to ensure the system operates as required with strong internal controls and security. - Periodic review on the manual guidelines and SOP of AIS to ensure any changes made to the system are documented and updated accordingly.

In an examination of the Federal Government of Malaysia, this study found a good relationship between the AIS users in the accounting office, as well as between the accounting office and other departments within the organisation. In addition, there is high cooperation amongst the AIS users within the Government. These teamwork practices are perceived important in order to smoothen and speed up the

accounting processes. It is because the accounting process started from not just the accounting department, but also from other departments that are involved in recording the economic and business transactions. For example, a transaction of vehicle license's fee that is paid by an individual at any authorised government offices is recorded by the respective office. Next, the recorded transaction is retrieved by the accounting office for review and further action. Therefore, good relationships and cooperation are needed in the AIS environment. Furthermore, the statistical analysis found these practices significantly enhance the impact of user commitment on the effectiveness of the AIS. Hence, keeping up the good performance on these practices can accelerate the achievement of AIS effectiveness with a high commitment amongst the system's users.

Apart from that, the optimisation of the AIS performance requires written rules, regulations, SOP and policies as guidelines for the system's users. Having all the needed guidelines will help the users to maximise the usage of the system. However, having the guidelines in place is only useful if the system's users comply with it. Most of the users agreed that compliance with the related rules, regulations, policies and procedures is important towards the system's effectiveness. The compliance reflects the users' commitment towards the system. In line with its importance, the system's users are found to comply with the respective guidelines, at least above the average expectation level. This achievement should be maintained in order to have an effective AIS in place and sustain the effectiveness.

In addition, the achievement of an effective AIS requires support from well-functioning technology. In the context of a complex government's system, the AIS can be huge and complicated. Hence, technology is needed to simplify the functions

and features of the system, while at the same time optimising the system's performance. The technical operation of technology may not be fully understood by the accounting personnel. This is because their knowledge related to the AIS is commonly limited to their job scope and experience. Therefore, an internal expert is needed to assist the AIS users in any cases related to the system. Besides, the internal expert is also responsible for looking over the system's maintenance, technical performance and security of the system. Adequate technical support from the IT department and the headquarters (i.e. the AGD), along with an experienced expert at the headquarters, are found to significantly influence the performance of the technology support function towards the AIS effectiveness. At present, the internal expert provides great support. This performance should be maintained to sustain the capability of the technology towards the achievement of AIS effectiveness.

Moreover, the performance of the technology support function is also influenced by monitoring and review activities. These activities comprise of: inspection of documents and procedures; system audits; and periodic reviews of the related guidelines and regulations. This study found that strong monitoring and review activities improve the technology support function towards the AIS effectiveness. Based on the quantitative result, the monitoring and review is performed well above the average level of the AIS users' expectation. However, the finding about the great performance of the system audit is slightly contradicted by the preliminary finding from the qualitative fieldwork. Concerning the qualitative finding, the system audit is not strongly present in the accounting department. This audit may be carried out without the accounting personnel's knowledge. Nevertheless, as discussed in the qualitative report, this audit might be substituted by

other activities or performed by other departments in the AGD. As the purpose of this audit is to ensure the system is operated as required with strong internal controls and security, maintenance jobs performed by the internal expert, and other monitoring and review activities (e.g. account balance checking, internal control test), may be assumed to represent the system audit. Dual perception towards the system audit as a formal audit activity or other activities representing the achievement of the system audit purposes has led to contradictory findings between the qualitative and quantitative analysis.

Additionally, this study found that the AIS users perceived a great culture practice in terms of appreciative and supportive environment towards the technology enhancement, as well as an open door policy to encourage employees' active engagement. Although these cultural practices are perceived important and perceived well performed by the system's users, it does not significantly influence the user commitment towards the AIS effectiveness. Thus, whether management wanting to maintain these practices or not, will not affect the achievement of the AIS effectiveness.

In summary, the areas discussed in this sub-section are well performed areas within the phenomenon of the critical factors of AIS effectiveness. Maintaining good work in these areas, except for the appreciative and supportive environment towards the technology improvement as well as the open door policy, are crucial in order to have an effective AIS in place.

iii. Low Priority Area

A low priority area suggests an area that requires less attention for improvement. In this area, both the perceived importance and the perceived performance scores are below the average level. This area implies less interest attributes according to the AIS users' opinions. Table 7.4 shows the list of low priority areas.

Table 7.4: Low Priority Area

Factor	Criteria
Knowledge	- AIS user understands the function and process in the system.
External Expert	- Vendor/consultant provides adequate technical support. - Vendor/consultant clearly understands the organisation's (i.e. ministry and the Government) requirements. - Vendor/consultant is experienced.
Internal Expert	- IT department gives prompt feedback.
Monitoring and Review	- Comparing the current AIS with AIS in other developing countries to ensure that the system in use is not outdated or using obsolete technology. - Comparing the current AIS with AIS in developed countries to encourage improvement of the system.

The AIS users believe that understanding of the functions and processes in the system is not critically important to them. It is also found that the understanding of the functions and processes in the AIS is below the average performance level. The result indicates that this area is not in the interest of the AIS users. It may be explained by their routine task in using the AIS. As every user is allocated a job scope, their usage of the system is limited to their allocated work. Thus, they may feel it is not necessary to understand the other functions and processes in the AIS. For example, accounting personnel that are in charge of salary payments will only use the system to review and approve the salary-related transactions. Most of the time, they will just focus on the functions and processes in their job scope. In

addition, the routine of their work makes them feel comfortable with the limited knowledge related to their job scope. Nevertheless, the statistical result of this study found the understanding of the functions and processes in the AIS significantly represents the knowledge of the system's users. Furthermore, knowledge is one of the antecedents for user commitment towards the AIS effectiveness. Thus, management should not leave this area as a low priority area. Instead, the management should promote, to the AIS users, the importance of understanding the processes and functions in the AIS beyond their job scope. This is important for the AIS users in order to improve their knowledge, which subsequently will enhance their commitment towards the system's effectiveness. Moreover, as the Government practises a staff rotation by allocating its employees to other departments or divisions every three to five years, improving the system's users' knowledge in terms of understanding of the functions and processes in the AIS will help them to accelerate their learning process in the new department.

Furthermore, this study also found that both the perceived importance and the perceived performance scores for *external expert* are below the average level of the AIS users' opinion. It implies that the AIS users do not really think that the *external expert* is crucial in the AIS environment. *External expert* is represented by adequate technical support, a clear understanding of the Government's requirements and experienced personnel. This finding is expected because majority of the survey's respondents (i.e. more than 75%) are from middle and lower management who are responsible for most daily accounting transactions. Any problems noted by them will first be forwarded to the internal expert. If the problem cannot be solved by the internal expert, further help will be requested (by the internal expert) from the

external expert. Therefore, in most cases, the AIS users do not interact directly with the external expert. That situation explains the AIS users' perception about the importance of the external expert. However, further analysis in this study revealed the importance of the external expert as one of the antecedents for the technology support function towards the AIS effectiveness. Thus, instead of considering the external expert as a low priority area, management should promote the importance of the external expert to all AIS users. In addition, management should brief the system's users about the benefit of having the external expert and encourage direct interaction between them. For example, management can arrange a program of knowledge transfer from the external expert to the AIS users. At present, the transfer of knowledge is only carried out between the external expert and the internal expert, and from the internal expert to the AIS users. Giving the AIS users opportunity to have direct interaction with the external expert can also encourage them to get involved in the system improvement processes. As a group of users that work closely with the system usage, they may have different valuable views towards the system when compared to the top level of management. Thus, they should be given an opportunity to voice their concerns to the external expert. Their opinions may be helpful in improving the AIS.

Similarly, the importance of the IT department in giving prompt feedback is also rated below the average level of importance and performance. It implies that slow feedback from the IT department does not really concern the AIS users. This is consistent with the reality of the accounting practice in the Malaysian Federal Government, in which the reliance on the internal expert is weighted towards the headquarters (i.e. the AGD), when compared to the IT department of each minnistry.

In practice, the accounting office is assisted by two IT personnel from each ministry. However, their scope is limited to minor technology matters only, such as computers and printer problems. Anything related to the AIS is referred to the headquarters. However, since prompt feedback from the IT department can contribute to a great technology support function towards the AIS effectiveness, the system's users should consider the importance of the IT department in terms of their prompt feedback.

Apart from that, the importance of some activities in monitoring and review are perceived below average. In addition, perceived performance of these activities is also rated below the average level of performance. The mentioned activities are the reviews of the AIS by comparing the current system in place with other systems in developing and developed countries. The purposes of these reviewing activities are to ensure the system in place is not using outdated technology and to encourage improvement of the system. The AIS users' opinion on perceived importance versus perceived performance on these activities indicates that these activities do not interest the majority of them. This finding is expected because the majority of survey respondents are the personnel involved with the groundwork in the accounting process (e.g. retrieving, sorting and processing data, reporting etc.). Thus, they are less likely to be interested in the system review. However, management should not ignore these activities because they significantly contribute to the greatness of the technology in order to support the AIS and help realise the effectiveness of the system.

Overall, the low priority condition that is perceived by a majority of the AIS users on the users' understanding of the system process and function, the importance of the external expert, the prompt feedback from the IT department and the

reviewing activities through a comparison of the present system with the system in other developing and developed countries, are actually among the important contributors in the AIS effectiveness environment. As mentioned in the previous paragraph, the majority of survey respondents are from middle and lower management, for whom some of the activities or areas do not directly relate to them. In practice, they are not really involved with the system review activities and they do not directly deal with the external expert. Thus, that explains the reason for the findings. However, the management team should place a particular focus on these areas and promote to the system's users their importance towards the AIS effectiveness.

iv. Over Performed Area (Possible Overkill)

In contrast with the area to focus, an over performed area is an area that is perceived by the AIS users as being of low importance, but has good performance. This area implies excessive resources or efforts that can be used to improve other areas that need more attention. However, some of the area might need improvement in terms of the way the AIS users perceived its level of importance instead of allocating the resources or efforts to other areas. Table 7.5 lists the over performed area according to the AIS users' opinions.

Table 7.5: Over Performed Area

Factor	Criteria
User Commitment	- Prioritise the use of AIS. - Actively involved in the decision making process (i.e. within groups, departments or in a higher level of management).
Knowledge	- The AIS user has an academic qualification in accounting or finance (with basic accounting). - The AIS user has experience in accounting and the system.

Some criteria in *user commitment*, which are the prioritisation of the AIS usage and the active involvement in decision-making, are perceived by the system's user as less important. These criteria are performed well according to the system's users' perceptions. The result suggests that these criteria are over performed, which the system's users have determined to be of high concern, exceeding their perceived importance level. However, that does not mean that these practices and efforts should be reduced or stopped. Based on the statistical findings of this study, these practices significantly represent the AIS user's commitment. Importantly, user commitment significantly influences the system's effectiveness. In particular, high commitment amongst the system's users leads to an effective AIS. Therefore, the performance of these criteria should be maintained. Rather, the management should make an effort to raise awareness amongst the AIS users about the importance of these criteria towards the effectiveness of the system. Besides, the Government has investing a huge amount of money in the system. Thus, it is a waste if the system's users did not optimise its usage. Moreover, active involvement in decision-making will encourage the AIS users to appreciate the accounting data as not just data, but as valuable information. It is also useful for them in order to be a better accountant. Getting involved in decision-making can enable them to interpret the information rather than merely carrying out their routine (e.g. retrieving, reviewing, reconciling etc.).

Apart from that, academic qualifications in accounting or finance (with basic accounting) and experience in accounting and AIS are rated by the system's users below the average level of importance. However, a majority of the AIS users perceived these criteria as well performed. These criteria represent the importance of *knowledge* in a phenomenon of the critical factors of AIS effectiveness. Concerning

the preliminary findings from the qualitative fieldwork of this study, some of the interviewees believed that it is not always necessary for the AIS user to have an accounting or finance academic qualification and experience in accounting and AIS. This is because the sophistication of technology has made the AIS easier to be used, even by personnel that have no accounting academic qualification background. One of the interviewees mentioned that the manual guidelines (e.g. SOP, written standards and regulations) and file manager that clearly describe the way of doing things, had minimised the need for accounting graduates at certain levels of management, especially the lower level. Nevertheless, for those involved in reporting and decision-making, the academic qualification in accounting or finance is crucial. Another interviewee said that it is easier to deal with someone who has an accounting academic qualification to solve any problem related to accounting records, because they understand the accounting transaction very well, when compared to personnel without accounting academic qualifications. Similarly, having experience in accounting and AIS give an advantage to the user to be more committed towards achieving the effectiveness of the system. In most cases, those with a great knowledge will tend to be more committed to their work, when compared to those with less knowledge. Although these criteria are perceived as less important, the AIS users, as well as the management, should maintain the performance on these criteria because these criteria are important in increasing the system's users' commitment level towards the system's effectiveness. Although some lower positions might not need the accounting or finance academic qualification and the experience in accounting and AIS, most of the accounting positions do need it. In practice, most of the accounting positions involved the

process of transforming data into valuable information. Therefore, management should place more emphasis on the importance of these criteria and allocate more accounting or finance graduates in accounting positions, especially at the middle and top management levels.

7.3 SUMMARY OF DISCUSSIONS

This study was conducted in order to achieve five research objectives. The objectives represent the phenomenon of the critical factors of AIS effectiveness. The first and second objectives are about exploring and developing the criteria and measurement for AIS effectiveness. The result of this study found and confirmed the suitability of system quality, information quality and benefit/usefulness of the system to proxy AIS effectiveness based on user satisfaction scale. These dimensions comprise of 10 items representing the valid and reliable criteria for an effective AIS. This study highlighted the concept pointed to by Ives et al. (1983) about a good system, in which a good system should be able to make its users perceive it as a good system; otherwise it is a poor system. Based on the descriptive statistics of the survey conducted for this study, on average, the system's users are satisfied with all dimensions in the AIS effectiveness. This finding is consistent with the preliminary qualitative findings, in which majority of the interviewees were satisfied with the system. These findings indicate the effectiveness of the current system.

The third and fourth objectives are intended to investigate the phenomenon of the critical factors of AIS effectiveness and examine the relationship between the variables in the phenomenon. On average, the AIS users descriptively perceived a good performance of all critical factors and its antecedents. Study about the

determinants and factors affecting the AIS and its effectiveness are not new in the accounting field. However, most of the previous studies focused on the adoption of the AIS or early implementation stage of the system. Interestingly, this study focused on an on-going and stable system. Specifically, this study concerned the process function in the AIS (i.e. transforming the accounting data into information). In contrast to previous studies, the specific focus (i.e. on-going and stable AIS) and concern (i.e. process function) in this study has led to very interesting findings. The result of this study emphasised the four main components of an AIS in anchoring the critical factors of the system's effectiveness. The components are people (translated into *user commitment*), technology (translated into *technology support function*), process and structure (both are translated into *teamwork*). As for an on-going and stable system, the *user commitment* and the *technology support function* are critically needed for the system's effectiveness. On the other hand, *teamwork* is found to enhance the impact of *user commitment* on the effectiveness of AIS.

Furthermore, there are also another five factors that were found to be significantly important within the phenomenon of the critical factors of AIS effectiveness. Nevertheless, unlike previous studies, these factors are found to be the antecedents for the critical factors towards the system's effectiveness, instead of the factors affecting the system's effectiveness. *Knowledge* and *top management support* are found to be the antecedents for the *user commitment* towards the AIS effectiveness. On the other hand, *internal expert*, *external expert* and *monitoring and review* activities are found to be the antecedents for the *technology support function* towards the system's effectiveness. These findings are interesting because they were

generated from grounded research that looked at the system's users' opinions. This was then supported by statistical analysis.

In addition to the statistical analysis performed on the relationships between variables in the research model, MGA analysis was conducted to recognise any significant differences among the relationships between the tested characteristics (i.e. individual and organisational). According to Sarstedt et al. (2011), homogeneity in respondents' opinion may not be fully achieved due to variances in their perception and judgement towards the tested variables. Specifically, the MGA in this study assesses the respondents' educational background, education level, background of department and organisation size that they are working with. As a result, the MGA finding have shed light on the variances of opinions between groups that occur due to differences among their individual characteristics and organisation characteristics. This finding provides evidence for management to take action on balancing the employees' perception about the importance of the identified significant factors towards AIS effectiveness.

Furthermore, the fifth objective aimed to examine the gap (i.e. difference in score) between perceived importance and perceived performance for all identified factors within the phenomenon. The result offers a wider view about the condition of each identified factors. Technically, the result discussed four areas according to the AIS users' opinions. Most importantly, the management should focus on the criteria that are classified under the area to focus, except for transfer of knowledge from the internal expert to the AIS users as it is found to insignificantly affect the system's users' commitment towards the system's effectiveness. The condition where perceived importance is higher than perceived performance may indicate

dissatisfaction amongst the system's users towards the rated criteria. High attention and improvement are needed on these criteria. On the other hand, area to maintain shows criteria that have well aligned between the perceived importance and perceived performance level. The system's users and the management should keep up their good work on these criteria. Concerning the result, the Malaysian Federal Government did quite well in aligning the importance and the performance of most criteria within the phenomenon. Apart from that, there are also low priority and over performing areas. However, these areas should not be ignored and the resources and efforts in these areas do not need to be allocated to the other areas. This is because, the criteria in these areas are found to have significant influences within the phenomenon of the critical factors of AIS effectiveness. Thus, the AIS users should maintain their performance on the criteria within these areas and the management should play a significant role in promoting the importance of those criteria to the system's users.

The next chapter, Chapter 8, is the conclusion of this thesis. Chapter 8 summarises the results of this study and elaborates the contributions, limitations and suggestions for future research.

CHAPTER 8: RESULTS, CONTRIBUTIONS, LIMITATIONS AND CONCLUSION

8.1 INTRODUCTION

This chapter presents the contributions, limitations and conclusion of this study. The contributions are discussed according to two main sub-sections, which are contribution to the body of knowledge and contribution to practice and policy. Furthermore, the limitations are explained accordingly, including suggestions for future research. Finally, the conclusion highlights the overall outcome of this study.

8.2 SUMMARY OF RESULTS

The findings of this study have been briefly discussed in the previous chapter (i.e. Chapter 7 – Discussion of Findings). This section summarises the results according to the research objectives and the research questions of this study. There are five objectives of this study that are addressed by five research questions. The research objectives and research questions are intended to understand the phenomenon of the critical factors of AIS effectiveness. In particular, the *Research Objective 1* and *Research Objective 2* are about the criteria and measurement of an effective AIS. Both objectives are addressed by *Research Question 1* and *Research Question 2*, as presented in Table 8.1 and Table 8.2, respectively.

Table 8.1: The Summary of Results for *Research Question 1*

Research Objective/ Research Question	Result
Research Objective 1 To explore the criteria of an effective AIS. Research Question 1 What are the criteria of an effective AIS?	i. System Quality - Ease of use (user friendly). - Processing time (speed). - Produce report as required. ii. Information Quality - Accurate (no doubt). - Complete - Relevant for the use in decision-making. iii. Benefit/Usefulness of AIS - Improve individual productivity. - Improve decision-making process. - Minimise unintentional human error. - Reduce hard copy submission.

Table 8.2: The Summary of Results for *Research Question 2*

Research Objective/ Research Question	Result
Research Objective 2 To develop a comprehensive measurement for AIS effectiveness. Research Question 2 Which of the identified criteria are reliable and valid to measure the AIS effectiveness?	All criteria representing system quality, information quality and benefit/usefulness of AIS are valid and reliable to measure AIS effectiveness.

Furthermore, *Research Question 3* and *Research Question 4* are designed to fulfil *Research Objective 3* and *Research Objective 4* of this study about: the phenomenon of the critical factors of AIS effectiveness; and the significant relationships between the identified factors within the phenomenon. Table 8.3 and Table 8.4 summarise the results for *Research Question 3* and *Research Question 4*, respectively.

Table 8.3: The Summary of Results for *Research Question 3*

Research Objective/ Research Question	Result
Research Objective 3 To investigate the phenomenon of the critical factors of AIS effectiveness. Research Question 3 What are the important factors that lead to an effective AIS? Which of the factors are critically important for the effectiveness of AIS?	The critical factors of AIS effectiveness: i. User Commitment ii. Technology Support Function The antecedents for User Commitment: i. Knowledge ii. Top Management Support iii. Culture The antecedents for Technology Support Function: i. Internal Expert ii. External Expert iii. Monitoring and Review Teamwork as a moderator of the relationships between the critical factors and AIS effectiveness.

Table 8.4: The Summary of Results for *Research Question 4*

Research Objective/ Research Question	Result
Research Objective 4 To examine the relationship between the identified factors within the phenomenon of the critical factors of AIS effectiveness.	All factors have significant influence within the phenomenon, except for *Culture*.
Research Question 4 Which of the identified factors are significantly influencing within the phenomenon of the critical factors of AIS effectiveness?	Teamwork is only significant at moderating the relationship between *user commitment* and *AIS effectiveness.*

In addition, *Research Question 5* is developed to further understand the condition of all identified factors within the phenomenon. The condition of these factors was assessed by evaluating the gap (i.e. difference) between perceived importance and perceived performance of each factor. As a result, some factors or criteria of the factors are highlighted for further action to be taken by management. Table 8.5 presents a summary of results for the answer to *Research Question 5*, in order to fulfil *Research Objective 5* of this study.

Table 8.5: The Summary of Results for *Research Question 5*

Research Objective/ Research Question	**Result**
Research Objective 5 To examine the gap between perceived importance and perceived performance of the identified factors within the phenomenon of the critical factors of AIS effectiveness in the Malaysian Federal Government. Research Question 5 What is the condition of the gap between perceived importance and perceived performance on the identified factors within the phenomenon of the critical factors of AIS effectiveness in the Malaysian Federal Government?	i. Management should give immediate attention to the following factors: - *Technology support function*. - *Teamwork* (i.e. Effective communication between management levels). - *Top management support*. ii. Management should promote the importance of the following factors to the AIS users and improve the factors' performance: - *Knowledge* (i.e. the AIS users' understanding of the function and process in the system). - *External expert*. - *Internal Expert* (i.e. prompt feedback from the IT department). - *Monitoring and Review* (i.e. comparing the current AIS with systems in other developing and developed countries). iii. Management should promote the importance of the following factors to the AIS users and maintain the factors' performance: - *User Commitment* (i.e. prioritise the use of AIS and active involvement in the decision-making process). - *Knowledge* (i.e. the AIS user has an academic qualification in accounting or finance, and experience in accounting and the system). iv. Keep up the good work on the following factors: - *Teamwork* (i.e. good relationship between the AIS users in the accounting office and between the accounting office and the other department within the organisation, and high cooperation amongst the AIS users). - *User Commitment* (i.e. compliance with related procedures and regulations). - *Internal Expert*. - *Monitoring and Review* (i.e. inspection of documentation and procedure, system audit and periodic review on the related rules and regulations).

8.3 CONTRIBUTIONS OF THE STUDY

8.3.1 Contributions to the Body of Knowledge

The findings from this study provide several contributions to the body of knowledge. First, this study contributes to the body of knowledge in terms of the multiple methods used to conduct the study. Specifically, this study provides evidence on the ability of multiple methods (i.e. a qualitative method followed by a quantitative method, in the context of this study) to triangulate the qualitative and quantitative findings and to obtain a better understanding of the phenomenon. In addition, this study also shows the evidence of the qualitative findings as a strong basis in developing and strengthening the research model, which can later be tested in the quantitative study. The application of the multiple methods in this study adds to the body of knowledge about the power of these methods if appropriately applied, especially in the context of AIS with limited literature.

Second, this study contributes to the body of knowledge in terms of the AIS effectiveness measurement. Applying an advanced method in Partial Least Squares Structural Equation Model (PLS-SEM), which is the Hierarchical Components Model (HCM), this study offers a comprehensive measure of the AIS effectiveness by combining three dimensions to constitute the system effectiveness. The dimensions are system quality, information quality and benefit/usefulness of the system. Each dimension is measured by its specific items based on user satisfaction scale. The items were developed and refined according to the AIS users' opinion, as well as the literature review. Conceptually, the items represent the criteria of an effective AIS, resulting in a rigorous yet simple measurement for the AIS effectiveness, as shown in Figure 8.1.

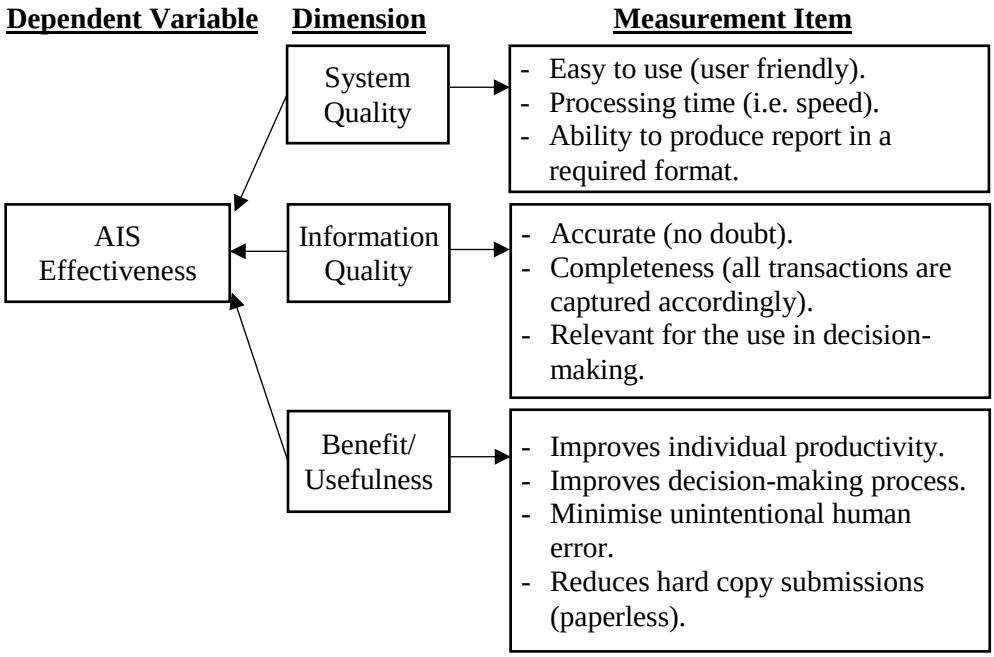

Figure 8.1: A Comprehensive Measure for AIS Effectiveness

The dimensions constituting the AIS effectiveness in this study have actually been applied to assess system success or effectiveness in previous studies. However, the dimensions are mostly applied individually as a measure for the system success or effectiveness. As far as this study is concerned, this study is the first that clearly combines and statistically tests the three dimensions to proxy system effectiveness based on user satisfaction measure, especially in the context of AIS. The comprehensive measurement of AIS effectiveness presented in this study has strengthened the existing measurement of system effectiveness. The measurement application is not just limited to the AIS field, but also appropriate to be applied in information system, Enterprise Resource Planning (ERP) and IT management.

Third, the questionnaire instrument for AIS effectiveness applies a satisfaction scale to measure the effectiveness. Instead of measuring the satisfaction as one of the measurement items by using the scale from disagree to agree or never

to always and so on, this study emphasised the system's users' satisfaction by putting it on the measurement scale. Thus, it gave a more accurate measurement of the level of satisfaction towards each criterion of the system's effectiveness. This has shed light on the ambiguity and arguments on the AIS measurement in the literature. In addition, the use of a satisfaction scale to measure the system's effectiveness is consistent with the definition of system effectiveness by Kouser et al. (2011), Salehi et al. (2010) and Nicolaou (2000), in which an effective system is a system that is apparently capable of meeting its users' requirement. The definition is also consistent with Ives et al. (1983) about the concept of a good system (i.e. capable of convincing its users). Moreover, this study has enlightened the previous definition of AIS effectiveness as a successfully applied system that is able to convince its users about its capability to meet the users' requirements and provide the expected outcomes. The outcomes include high quality information, a high quality system and benefits/usefulness of the system.

Fourth, this study highlighted the importance of the four main components of AIS, which are people, technology, process and structure, towards the achievement of the system's effectiveness. Instead of struggling with too many factors affecting the AIS and its effectiveness, this study refined the list and found the significance of the four main components of the AIS towards the system's effectiveness. These components have been translated according to the qualitative findings of this study: people are translated into user commitment; technology is viewed based on its support function towards the system; and both process and structure refer to teamwork practice amongst the AIS users. Besides, the other identified factors (i.e. knowledge, top management support, internal expert, external expert and monitoring

and review) are found to be the antecedents for the critical factors of AIS effectiveness. This finding reflects the real practice for an on-going and stable system. Furthermore, the findings explain the reason for the mixed findings in the literature, as well as the difference in the findings between this study and the previous studies, in which the factors that significantly influence the system during the adoption and early implementation stage may or may not be significant when the system reaches maturity and stability. Thus, this study presented a model, for an on-going and stable system, of the phenomenon of the critical factors of AIS effectiveness as illustrated in Figure 8.2.

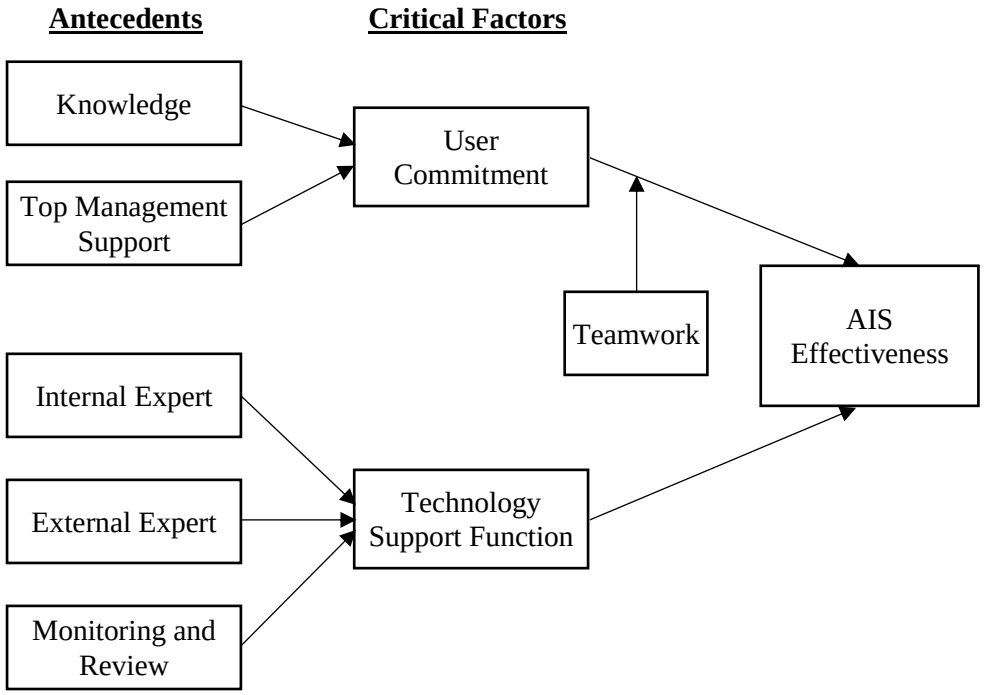

Figure 8.2: A Model of the Phenomenon of the Critical Factors of AIS Effectiveness

Fifth, the application of the IPA Matrix to assess the importance-performance gap's condition for each factor within the phenomenon model provides better insight into the phenomenon. The matrix was adopted from the marketing field and has been

popularly used to assess customer satisfaction. At present, the evidence of its application in the accounting and information system is too limited. Furthermore, the implication of the matrix application, in previous studies, in measuring satisfaction is rather limited for providing the management team a practical strategy on how to perform better and how fulfil the customers' or users' needs. Interestingly, its application to measure the importance-performance gap in this study offers richer findings for a practical strategic direction to both, the AIS users and the management. Its findings also offer a greater implication in terms of providing suggestions for areas that require attention and improvement, to be worked together by the users and the management, in order to continuously achieve the effectiveness of AIS. Thus, this study contributes to the body of knowledge for the suitability and capability of the IPA matrix to measure the importance-performance analysis beyond satisfaction assessment purposes.

Sixth, an argument about using a statistical method to derive the *importance* scores as a more appropriate technique may not always be the best technique. In particular, the argument is that a survey's respondents might tend to rate all examined attributes or factors as highly important. However, obtaining the *importance* scores from a survey's respondents reflect their opinion and the way they perceived things, especially in measuring the importance-performance gap in an organisation. Furthermore, employees' opinions on how important the examined attributes or factors are to them offers an opportunity to the management to better understand their employees. Moreover, when the purpose of the assessment is to find a gap between importance and performance, the low priority area and the over-performed area that are indicated through the score rated by only one side (i.e. AIS

users, in the context of this study) might not always be true. It can be because the respondents did not realise the importance of the attributes or factors, which might be due to a lack of knowledge, awareness or understanding. This is proved in this study, in which certain factors that are statistically relevant were found to have a significant influence on the AIS effectiveness yet were perceived to be below the average importance level by the system's users. Thus, instead of ignoring the factors in the low priority area, or allocating the effort and resources in the over-performed area to other areas, the management may need to conduct a program or create a strategy to improve the systems' users' understanding towards the importance of those factors. Based on the evidence from this study, it shows that obtaining the *importance* score from a survey's respondents provide another view in analysing the IPA matrix and provide better understanding towards the investigated phenomenon.

Given the importance of the AIS in any organisations regardless of the sector, the presented model, measurements and research instrument reported in this study are also suitable for application in other contexts (e.g. private sector, SME and etc.) in assessing an on-going and stable system. In addition, having a standard measure of AIS effectiveness will allow for a comparison between studies and provide a stronger discussion for any mixed findings reported (i.e. mixed findings that are caused by the differences in culture or background of the organisation, rather than because of differences in measurement applied between studies).

8.3.2 Contributions and Recommendations to Policy and Practice

This study was conducted based on the AIS users' opinions towards the system and its environment. Thus, the results reflect the current practice and contribute to a

better understanding towards the phenomenon of the critical factors of AIS effectiveness. In addition, this study offers several recommendations for management to consider for improvement, especially the Malaysian Federal Government.

First, the findings on the critical factors of AIS effectiveness, its antecedents and the importance of teamwork practice in this study provide a basis for an organisation to achieve the effectiveness of the system. As the Malaysian Federal Government is currently upgrading their AIS, the performance of these factors, the antecedents and teamwork are suggested to be managed properly in order to have an effective system in place. Maintaining good performance of the critical factors, its antecedents and teamwork will help to accelerate the achievement of the AIS effectiveness for the upcoming upgraded system. In addition, based on the MGA finding, this study provides suggestions for management: (i) to raise awareness among the employees on the importance of the significant factors identified in this study regardless of their educational background and education level; (ii) to balance the exposure about the among organisation regardless of the organisation size and background of department (i.e. accounting office and responsibility centre). These can be probably done by providing relevant trainings to the employees and minimising the gap between small and large ministries, as well as between accounting office and responsibility centre.

Second, the use of the IPA matrix in this study to assess the importance-performance gap of all identified variables provides a tool for an organisation to evaluate the condition of those variables. Given the importance of those variables in the achievement of the AIS effectiveness, knowing the condition of the variables can help the management team in setting up their plan. Therefore, this study recommends

a periodic evaluation on the condition of each identified variable to help the management to identify the areas that have improved and need improvement. Besides, the IPA matrix's result offers a clear picture of the AIS users' perception towards the importance and performance of the examined factors. In addition, the IPA matrix's result provides management a strategic direction to take further action and plan, in order to achieve the effectiveness of the system.

Third, this study suggests several areas that require attention from management in the Malaysian Federal Government. These areas need immediate action for improvement: technology capability to support the system (i.e. up-to-date hardware and software, strong data protection and back-up and integration between accounting system and other systems in the Government); effective communication between levels of management; and top management support (i.e. encouragement of training attendance, appreciation and utilisation of information produced by AIS, and encouragement of AIS improvement). As the Government is in the process of upgrading its AIS, these areas should be managed and improved accordingly in order to prepare for the upcoming upgraded system. At the time of writing this thesis, the upcoming upgraded system (i.e. 1GFMAS), originally expected to be commissioned in 2015, has been delayed. According to a key person in the Government, the 1GFMAS is now expected to be in operation by 2018. The delay of 1GFMAS may also delay the transition of the Malaysian Federal Government's accounting treatment from cash-based accounting to accrual-based accounting, as the system is needed to support accrual accounting transactions. The delay is said to be caused by many factors surrounding the system development (e.g. system configuration, system test, facilities, readiness of the employees etc.). Nevertheless, full consideration to

ensure the system is ready to take place is needed, rather than simply to meet the deadline of its implementation. While full support from all relevant parties (e.g. top management, employees, experts etc.) is needed to realise success of the 1GFMAS implementation, this study provide a strategic direction to accelerate the achievement of AIS effectiveness as well as sustaining the effectiveness, especially for the upcoming upgraded system.

Fourth, this study also recommends several areas that require Government management to take further action. These areas are perceived to be less important by the AIS users. Nevertheless, this study found that these areas are significantly important within the phenomenon of the critical factors of AIS effectiveness. Thus, it is recommended that management raise awareness amongst AIS users about the importance of these areas. The areas are prioritisation of AIS usage, active involvement in decision-making, knowledge based criteria, external expert, prompt feedback from the IT department and review of the system in terms of comparison between the current AIS with AIS in other developing and developed countries. Specifically, the knowledge based criteria are academic qualifications in accounting or finance (i.e. with basic accounting), experience in accounting and AIS, and understanding of the function and process in the AIS. On the other hand, the specific criteria of the external expert are adequate technical support, an understanding of the government requirements and experienced personnel. Raising awareness amongst the system's users about the importance of these criteria will be helpful as preparation for the upcoming upgraded AIS.

Fifth, the findings of this study reveal the importance of knowledge in accounting and AIS, including the accounting academic qualification and the

experience in accounting and AIS. In addition, this study supports the management's recommendation to allocate at least one accounting staff member to each responsibility centre throughout the country. As such, it is suggested to the Government to consider the management's recommendation of the accounting personnel allocation in order to enhance the system's users' commitment towards the achievement of an effective AIS. A proper allocation of the accounting personnel is believed to be an important enabler for smoothening the accounting process.

These recommendations are not just limited to the Malaysian Federal Government's organisations, but are also suitable for implementation in other sectors, such as private sector organisations. The research model presented in this study provides the critical factors of AIS effectiveness and its antecedents, which if properly managed will lead to the effectiveness of the AIS, regardless of the type of the organisation or sector. Furthermore, the result of the importance-performance gap evaluation in this study has proved the benefit of assessing those identified factors for management's strategic planning, regardless of any sector. In addition, the recommendation of the importance of accounting personnel allocation should also be noted by other types of organisation. AIS users that have an accounting academic qualification and experience in accounting and the system are more committed to achieving the effectiveness of the AIS.

8.4 LIMITATIONS AND SUGGESTIONS FOR FUTURE STUDIES

In spite of thorough methods applied in this study and its detailed analysis, there are some limitations that should be noted. First, this study applied a multiple methods approach, in which the research model and the survey instrument are developed

based on the qualitative findings and the literature review. Thus, the proposed variables and its measurements are limited to the findings from the qualitative fieldwork and the literature review when it tested for a larger scale in the quantitative study. There might be other variables not discovered in the literature and the qualitative fieldwork, due to the context of the interviewees (i.e. accounting office at ministry level only) and their availability. Therefore, future studies may wish to consider a comprehensive qualitative method that includes the accounting office and the responsibility centre.

Second, the data of this study were solely obtained from individual opinion. As such, bias in opinion might present because opinion is easily influenced by other factors, such as experience, background and environment. However, totally neglecting their opinion might not reflect the real phenomenon. In addition, individual opinion and rating on the AIS effectiveness and other factors in the research model are depending on personal judgement, which may or may not be accurately disclosed by the respondents. The basis for their opinion may vary from one respondent to another, as well as over time. Thus, the findings of this study, which is subject to individual opinion and judgement towards the system, may reflect situational bias. In reality, individual bias is impossible to eliminate. Nevertheless, critical consideration has been taken during the selection of targeted sample for this study in order to minimise the irrelevant opinion and judgement. Therefore, future studies may consider mixing opinion and technical evaluation, using a mixed methods approach. For example, knowledge can be evaluated technically through a test of the AIS related questions or user commitment can be assessed through an observation of the system's user on how he or she uses the system.

Moreover, the statistical findings of this study is solely based on individual judgement from accounting personnel (i.e. grade W) in accounting departments and responsibility centres, without identifying their specific areas or sub-parts of the system (i.e. budgeting, decision making, controlling etc.). The respondents may have been exposed to different and limited areas or sub-parts of the system that lead to variances in their judgement. In other words, respondents might be biased about their judgement towards the system according to their position in an organisation, usage of the system, intention towards using the system and their experience with the system (those who have experience in the development of the system). According to Cinquini and Mitchell (2005), system users' opinion towards the system success varies according to their roles, task and function related to the system. In practice, the accounting personnel in accounting department and responsibility centre of the Malaysian Government are only responsible to do the accounting functions (e.g. recording, analysing, reconciling, reporting etc.). However, some of them might have experience with the system development (i.e. during the adoption and early implementation of the accounting system). When the system reached its stability and maturity stage, the system is monitored, maintained and improved from time to time by the AGD. As this study is aimed for developing a comprehensive measure of AIS effectiveness, accounting personnel who involved in processing function of the system have been selected to be the respondents for the quantitative study. Hence, the absence of other stakeholders' perspective (i.e. solely decision makers, system developer, politicians etc.) is a further limitation for the statistical findings. Thus, future studies may consider focusing on a specific area and a specific stakeholder to

get a closer view of the system effectiveness according to the function of the specific area as well as the roles of the targeted stakeholder.

Third, the research model of this study is limited to the context of accounting department for an on-going and stable system. As discussed in previous chapters, factors influencing the system may or may not be the same during early implementation stage and post implementation stage (i.e. mature and stable system). Thus, careful consideration should be taken before adopting the research model of this study to different setting of study (i.e. other department such as IT department). Nevertheless, this limitation does not restrict future studies to use the model and duplicate its instrument in other business sector or countries.

Fourth, the context of this study is limited to the Malaysian Federal Government. In addition, it focused on accounting personnel for its participants. Non accounting personnel involved in data recording or personnel that develop or technically maintain the technology related to the system, such as those from the IT department, might have different opinions towards the studied phenomenon. Moreover, other contexts such as the private sector, Small and Medium-sized Enterprises (SME), public listed companies and so on, might lead to different findings due to the different nature of their business and environment. As such, future studies may wish to apply the methods, research model and survey instrument of this study to other contexts of study.

Fifth, system usage in the context of this study is mandatory. Voluntary usage of the system may discover other variables or result in different findings from this study. In the case of voluntary use, the users' willingness to use the system depends on what they thought as the best practice. Thus, the antecedents for their commitment

might be different from the findings of this study. Hence, selecting a voluntary usage context in a future study by using the method and instrument of this study can be a basis that permits a comparison between studies of mandatory and voluntary usage of the system.

8.5 CONCLUSION

The advancement of technology in the last decades has enabled the capability of the AIS to offer various outcomes beyond its traditional purpose (i.e. providing information to support the decision-making process). The findings of this study provide substantial contributions to the understanding about the phenomenon of the critical factors of AIS effectiveness. Multiple methods used in this study allowed triangulation between the qualitative and quantitative findings, which have enlightened the understanding of the phenomenon currently happening.

As a result, this study presented a comprehensive user satisfaction measure of AIS effectiveness that is constituted by three dimensions: system quality; information quality; and benefit/usefulness of the system. In addition, this study highlighted four main components of the AIS (i.e. people, technology, process and structure) to anchor the critical factors of the system's effectiveness. Moreover, the findings of this study have also revealed the antecedents for the critical factors of AIS effectiveness.

As a conclusion, it is believed that the findings of this study could foster a strategic plan for the achievement of AIS effectiveness. Additionally, this study sheds light on the issue of various measures for AIS effectiveness, as well as too many factors influencing the system's effectiveness in the literature. Therefore, the

researchers are encouraged to further examine the relationships within the presented phenomenon based on the research model and the survey instrument of this study, in other contexts, to enable comparison between studies.

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Appendix A: Supervisor's Support Letter to Undertake Fieldwork Interviews

University of Strathclyde Business School

DEPARTMENT OF ACCOUNTING & FINANCE

26 February 2015

TO WHOM IT MAY CONCERN

Re: Ms Sharinah Binti Puasa

As the supervisor of Mr Puasa's doctoral studies, I confirm that I support her request to travel to Malaysia, in order to undertake fieldwork interviews, and data gathering, as identified in her research proposal.

Yours faithfully

Dr Julia A Smith

Email: Julia.smith@strath.ac.uk

Appendix B: Approval Letter to Conduct Research in Malaysia

Sharinah Binti Puasa
KP. 0374, Kampung Pantai
87000 Labuan
Sabah
Email : sharinahpuasa@gmail.com

UPE 40/200/19/3210
(7)

16 March 2015

APPLICATION TO CONDUCT RESEARCH IN MALAYSIA

With reference to your application, I am pleased to inform you that your application to conduct research in Malaysia has been approved by the **Research Promotion and Co-Ordination Committee, Economic Planning Unit, Prime Minister's Department.** The details of the approval are as follows:

Researcher's name	:	**SHARINAH BINTI PUASA**
Passport No./ I.C No	:	**851108-15-5000**
Nationality	:	**MALAYSIA**
Title of Research	:	**"MODERATING EFFECT OF KNOWLEDGE ALIGNMENT ON CRITICAL SUCCESS FACTORS OF ACCOUNTING INFORMATION SYSTEMS EFFECTIVENESS"**
Period of Research Approved	:	**3 YEARS**

2. Please collect your Research Pass in person from the Economic Planning Unit, Prime Minister's Department, Parcel B, Level 4 Block B5, Federal Government Administrative Centre, 62502 Putrajaya, Malaysia. Bring along **two (2) colour passport size photographs.** Kindly, **get an appointment date from us before you come to collect your research pass.**

3. I would like to draw your attention to the undertaking signed by you that you will submit without cost to the Economic Planning Unit the following documents:

a) A brief summary of your research findings on completion of your research and before you leave Malaysia; and

b) Three (3) copies of your final dissertation/publication.

4. Lastly, please submit a copy of your preliminary and final report directly to the State Government where you carried out your research. Thank you.

Yours sincerely,

Munirah

(MUNIRAH BT. ABD MANAN)
For Director General
Economic Planning Unit
Email: munirah@epu.gov.my
Tel : 03 88882809
Fax: 03 88883798

ATTENTION

This letter is only to inform you the status of your application and **cannot be used as a research pass.**

Appendix C: Administered Questionnaire

THE CRITICAL FACTORS OF ACCOUNTING INFORMATION SYSTEMS (AIS) EFFECTIVENESS

This survey comprises of **three (3) sections**:
1. AIS Effectiveness based on User Satisfaction Approach
2. The Critical Factors of AIS Effectiveness and its Antecedents
3. Respondent's Profile

The **purpose of this survey** is to get **your opinion** towards the AIS in your organisation in terms of:
1. **Level of satisfaction** towards the system
2. **Level of importance** for each factor listed
3. **Level of performance** for each factor listed

Your participation can help us to better understand the phenomena of AIS effectiveness, its critical factors and the antecedents for the critical factors. This survey will take approximately 15-20 minutes to complete.

All responses will be treated with confidentiality.

Thank you for your help.

Yours sincerely,
Sharinah Puasa and Dr. Julia A. Smith
Department of Accounting and Finance
Strathclyde Business School
University of Strathclyde
Glasgow G4 0QU
Scotland, United Kingdom
Email address: sharinah-binti-puasa@strath.ac.uk or sharinahpuasa@gmail.com

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Definition Accounting Information System (AIS) in this survey refers **to the system that used to records, processes and manages** the accounting data into information.

It includes the whole processes **from input to output** and its **related procedures/regulations**.

SECTION 1: AIS Effectiveness Based on User Satisfaction Approach

This section consists of three (3) sub-sections:

A. System quality
B. Information quality
C. Benefit/usefulness of the AIS

Each sub-section requires you to assess your level of satisfaction with **the current system***.

*GFMAS, *eSPKB*, *eTerimaan* and its related process, procedures and regulations.

Please **answer all questions**.

Please rank each response on a scale from **very dissatisfied** to **very satisfied.**

Important note: The assessment on the level of satisfaction **focus on the current system in use*.**

***GFMAS, *eSPKB*, *eTerimaan* and its related process, procedures and regulations.

A). System Quality

	Your level of satisfaction towards the **current system**				
	Very dissatisfied	**Dissatisfied**	**Neither satisfied nor dissatisfied**	**Satisfied**	**Very satisfied**
i. The system is easy to use (user friendly).	1	2	3	4	5
ii. The processing time (i.e. speed) of the system.	1	2	3	4	5
iii. The system is able to produce report in a required format.	1	2	3	4	5

B). Information Quality

	Your level of satisfaction towards the **current system**				
	Very dissatisfied	**Dissatisfied**	**Neither satisfied nor dissatisfied**	**Satisfied**	**Very satisfied**
i. The information is accurate (no doubt).	1	2	3	4	5
ii. The information is complete (all transactions are captured accordingly).	1	2	3	4	5
iii. The information is relevant for use in decision making.	1	2	3	4	5

C). Benefit/Usefulness of AIS

	Your level of satisfaction towards the **current system**				
	Very dissatisfied	**Dissatisfied**	**Neither satisfied nor dissatisfied**	**Satisfied**	**Very satisfied**
i. The system improves individual productivity.	1	2	3	4	5
ii. The system improves the decision-making process.	1	2	3	4	5
iii. The system minimises unintentional human error.	1	2	3	4	5
iv. The system reduces hard copy submissions (paperless).	1	2	3	4	5

SECTION 2: The Critical Factors of AIS Effectiveness and its Antecedents

This section consists of three (3) sub-sections:

A. People factor
B. Organisation factor
C. Technology factor

Please **answer all questions**.

Each sub-section contains two (2) columns that measure **perceived importance** and **perceived performance**.

Please choose the answer that best represents **your opinion** based on the scale given in **both columns**.

Both columns should be answered independently and do not reflect each other's answer.

Important note: The assessment on the factors listed **focuses on the current system in use*.**

*GFMAS, *eSPKB*, *eTerimaan* and its related process, procedures and regulations.

Perceived Importance *(Your opinion about the importance of each factor towards AIS and its components)*					**A). People Factor**	**Perceived Performance** *(Your opinion about the performance in your organisation of each factor listed)*				
Not important	**Slightly important**	**Fairly important**	**Important**	**Very important**		**Poor**	**Fair**	**Good**	**Very good**	**Excellent**
					1. User Commitment					
1	2	3	4	5	i. Compliance with SOP, policies, standards, rules and regulations.	1	2	3	4	5
1	2	3	4	5	ii. Prioritise the use of AIS.	1	2	3	4	5
1	2	3	4	5	iii. Actively involved in the decision making process (i.e. within group, department or in higher level of management).	1	2	3	4	5
					2. Knowledge					
1	2	3	4	5	i. AIS user understands the accounting standards.	1	2	3	4	5
1	2	3	4	5	ii. AIS user has academic qualifications in accounting or finance (with basic accounting).	1	2	3	4	5
1	2	3	4	5	iii. AIS user has experience in accounting and the system.	1	2	3	4	5
1	2	3	4	5	iv. AIS user understand the functions and processes in AIS.	1	2	3	4	5
					3. Top Management Support					
1	2	3	4	5	i. Manager/supervisor encourages employees to attend training.	1	2	3	4	5
1	2	3	4	5	ii. Top management appreciates and utilises the information produced by AIS.	1	2	3	4	5
1	2	3	4	5	iii. Top management encourages the improvement of AIS.	1	2	3	4	5

Continue…

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					4. Internal Expert					
1	2	3	4	5	i. IT department provides adequate technical support.	1	2	3	4	5
1	2	3	4	5	ii. IT department gives prompt feedback.	1	2	3	4	5
1	2	3	4	5	iii. The headquarters (i.e. the AGD) provides adequate technical support	1	2	3	4	5
1	2	3	4	5	iv. The person in charge at the headquarters (i.e. the AGD) is experienced.	1	2	3	4	5
					5. External Expert					
1	2	3	4	5	i. The vendor/consultant provides adequate technical support.	1	2	3	4	5
1	2	3	4	5	ii. The vendor/consultant clearly understands the organisation's (i.e. ministry and the Government) requirements.	1	2	3	4	5
1	2	3	4	5	iii. The vendor/consultant is experienced.	1	2	3	4	5

Perceived Importance *(Your opinion about the importance of each factor towards AIS and its components)*						**Perceived Performance** *(Your opinion about the performance in your organisation of each factor listed)*				
Not important	**Slightly important**	**Fairly important**	**Important**	**Very important**	**B). Organisation Factor**	**Poor**	**Fair**	**Good**	**Very good**	**Excellent**
					1. Monitoring and Review					
1	2	3	4	5	i. Comparing the current AIS with AIS in other developing countries to ensure that the system in use is not outdated or using obsolete technology.	1	2	3	4	5
1	2	3	4	5	ii. Comparing the current AIS with AIS in other developed countries to encourage system improvement.	1	2	3	4	5
1	2	3	4	5	iii. Performing inspection (naziran) of documentation and procedure.	1	2	3	4	5

Continue…

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1	2	3	4	5	iv. System audit (system check) in order to ensure the system operates as required with a strong internal control and security.	1	2	3	4	5
1	2	3	4	5	v. Periodic review of the manual guideline and SOP of AIS to ensure any changes made to the system are documented and updated accordingly.	1	2	3	4	5
					2. Teamwork					
1	2	3	4	5	i. Effective communication between levels of management (i.e. top, middle and lower).	1	2	3	4	5
1	2	3	4	5	ii. AIS users actively share useful information among employees (while considering confidentiality) to update any necessary information.	1	2	3	4	5
1	2	3	4	5	iii. There is a good relationship between AIS users in the accounting office.	1	2	3	4	5
1	2	3	4	5	iv. There is a good relationship between accounting office and other departments within the organisation (i.e. ministry).	1	2	3	4	5
1	2	3	4	5	v. There is high cooperation among AIS users within the Government.	1	2	3	4	5
					3. Culture					
1	2	3	4	5	i. Appreciative and supportive environment towards technology enhancement.	1	2	3	4	5
1	2	3	4	5	ii. Open door policy to encourage employees to seek advice, offer suggestions and actively exchange ideas.	1	2	3	4	5
1	2	3	4	5	iii. Transfer of knowledge from an internal expert to other AIS users.	1	2	3	4	5

Continue…

…continue

Perceived Importance *(Your opinion about the importance of each factor towards AIS and its components)*					**C). Technology Factor**	**Perceived Performance** *(Your opinion about the performance in your organisation of each factor listed)*				
Not important	**Slightly important**	**Fairly important**	**Important**	**Very important**		**Poor**	**Fair**	**Good**	**Very good**	**Excellent**
					1. Technology Support Function					
1	2	3	4	5	i. Up-to-date hardware and software.	1	2	3	4	5
1	2	3	4	5	ii. Strong data protection technology and back-up.	1	2	3	4	5
1	2	3	4	5	iii. Integration between systems in the government (i.e. GFMAS integrated with other e-Government systems).	1	2	3	4	5

SECTION 3: Respondent's Profile

This section requires you to provide your profile. Please **answer all questions**.

1. Gender:
   - ☐ Male
   - ☐ Female

2. Age as of 1st January 2016 (in year):
   - ☐ Less than 21
   - ☐ 21 – 30
   - ☐ 31 – 40
   - ☐ 41 – 50
   - ☐ 51 – 60
   - ☐ Above 60

3. Qualification of educational background:
   - ☐ Solely in accounting field
   - ☐ Mixed accounting and other fields (e.g. business admin, human resource, marketing, finance and etc.)
   - ☐ Non-accounting field

4. Highest education level:
   - ☐ PhD (Doctor of Philosophy)
   - ☐ Master's Degree
   - ☐ Bachelor's Degree
   - ☐ Diploma/STPM/A-Level
   - ☐ SPM
   - ☐ Other, please specify: _____

5. Do you have any professional qualification? (e.g. ICAEW, ACCA, CPA, MICPA or any non-accounting professional qualification).
   - ☐ Yes. Please state: _____
   - ☐ No

6. Are you currently a member in any professional body? (e.g. Malaysian Institute of Accountants – MIA).
   - ☐ Yes, please state: _____
   - ☐ No

7. The background of your department.
   - ☐ Newly appointed Self-Accounting Department (SAD)
   - ☐ Existing Self-Accounting Department (SAD)
   - ☐ Responsibility centre

8. Employment record:
   i. Position: _____
   ii. Grade: _____

9. Experience in Accounting Information System software:
   - ☐ GFMAS
   - ☐ *eSPKB*
   - ☐ *eTerimaan*
   - ☐ Other software in e-Government. Please state: _____
   - ☐ Other software in private sector (i.e. SAP, Oracle, Sunsystems, SAGE, UBS). Please state: _____

10. How many years have you been working in the government/public sector? _____

11. Have you ever worked in the private sector before joining the government/public sector?
    - ☐ Yes. Please state the number of year(s) you worked in the private sector: _____
    - ☐ No

12. If you have any comments or opinions to share, please use the space provided below.

_____

_____

_____

_____

-THE END OF QUESTIONNAIRE-

Appendix D: Consent Email from the Accountant General's Department with regards to the Unstructured Preliminary Fieldwork

Status permohonan lawatan untuk tujuan kajian ke Jabatan Akauntan Negara Malaysia

Juliana Binti Saleh [julia@anm.gov.my]
Sent: 09 April 2015 02:27
To: Sharinah Binti Puasa
Cc: Unit Perancangan Korporat [upk@anm.gov.my]; Dr. Yacob Bin Mustafa [yacob@anm.gov.my]; Samsiah Binti Ahmad [samsiah.ahmad@anm.gov.my]; Mohd Azmi Bin Mohamed Yazid [azmi.yazid@anm.gov.my]; Intan Yusniazura binti Mohamed Yusop [intan.yusniazura@anm.gov.my]; Norhasrin B Katuk [hasrin@anm.gov.my]; Ainunhamimi Binti Mohd Soberi [ainunhamimi@anm.gov.my]; Norhidayu Binti Yahya [hidayu.yahya@anm.gov.my]; Nur Arzleyana binti Ariffin [yana@anm.gov.my]; Nor Hafizah Binti Mohd Termizi [hafizaht@anm.gov.my]

بسم الله الرحمن الرحيم
السلام عليكم ورحمة الله وبركاته

Salam Sejahtera & Salam 1Malaysia,

Puan,

Saya dengan hormatnya merujuk kepada perkara di atas.

2. Untuk makluman puan, berikut adalah tarikh-tarikh yang telah dipersetujui bagi lawatan kajian puan:

Bil.	Pegawai/Bahagian Yang Ingin Ditemui	Pegawai Yang Boleh Dihubungi	Tarikh Yang Telah Dipersetujui
1	ANM	Pn. Intan Yusniazura bt. Mohamed Yusop PA ANM (intan.yusniazura@anm.gov.my)	24 April 2015 (4.00 petang)
2	BPOPA	Dr. Yacob b. Mustafa Timbalan Pengarah W54 yacob@anm.gov.my	24 April 2015
3	BPPP	Pn. Rosenida bt. Abd. Rahman Timbalan Pengarah W54 rosenida@anm.gov.my	27 – 28 April 2015
4	BPOPP	Pn. Samsiah bt. Ahmad Timbalan Pengarah W54 samsiah.ahmad@anm.gov.my	14 – 15 Mei 2015
5	BPTM	En. Mohd Azmi b. Mohd Yazid Timbalan Pengarah W54 azmi.yazid@anm.gov.my	18 – 21 Mei 2015

Kerjasama dan perhatian yang diberikan amatlah dihargai.

Sekian, terima kasih.

"BERKHIDMAT UNTUK NEGARA"
"Inovasi & Integriti Merealisasi Perakaunan Akruan"

Saya yang menurut perintah,

Juliana

Juliana Binti Saleh C.A.(M)
Ketua Penolong Pengarah
Unit Perancangan Korporat
Bahagian Pembangunan Perakaunan dan Pengurusan
Jabatan Akauntan Negara Malaysia
Kompleks Kementerian Kewangan
No.1, Persiaran Perdana, Presint 2
62594 WP PUTRAJAYA

Tel : 03-8882 1090
Faks : 03-8882 1042

Translation for the content of the email dated on 9th April 2015.
Subject: The Status of Application for A Study Visit to the Accountant General's Department

Greetings and Salam 1 Malaysia,

Dear Miss,

I respectfully refer to the above matter.

2. For your information, the dates listed below have been agreed for your study visit by the respective divisions.

	Division	Contact Person	Agreed Date
1.	ANM – Accountant General	Pn. Intan Yusniazura bt. Mohamed Yusop PA ANM (Intan.yusniazura@anm.gov.my)	24th April 2015 (4.00 pm)
2.	APOPA - Central Operation and Agency Service Division	Dr. Yacob b. Mustafa Deputy Director W54 yacob@anm.gov.my	24th April 2015
3.	BPPP - Accounting and Management Development Division	Pn. Rosenida bt. Abd. Rahman Deputy Director W54 rosenida@anm.gov.my	27th - 28th April 2015
4.	BPOPP - Branch Operation and Management Division	Pn. Samsiah bt. Ahmad Deputy Director W54 samsiah.ahmad@anm.gov.my	14th – 15th May 2015
5.	BPTM - Information Technology Development Division	En. Mohd Azmi b. Mohd Yazid Deputy Director W54 azmi.yazid@anm.gov.my	18th - 21st May 2015

Your attention and cooperation are highly appreciated.

Thank you.

Appendix E: Example of Chart of Account for the Malaysian Federal Government (extracted from AGD's Circular Number 8/2014) – Emoluments Code

Contoh Penjenisan Kod Perbelanjaan bagi Emolumen adalah seperti berikut:-

Jenis Objek	Kod Objek	Perihal Kod
Objek Am	10000	Emolumen
Objek Sebagai	11000	Gaji dan Upahan
Objek Kumpulan Lanjut	11100	Gaji Kakitangan Awam
Objek Lanjut	11101	Gaji Biasa Kakitangan Awam
	11102	Gaji Kakitangan Awam Ambilan Tempatan Luar Negeri

Appendix F: Invitation Letter and Consent Form for Semi-Structured Interviews

Chief Accountant
Ministry of Agriculture and Agro-Based Industry
Accounting Division
Block 4G1 Wisma Tani, No.28 Persiaran Perdana
Precinct 4, Federal Government Administrative Centre
62624 PUTRAJAYA

18th June 2015

Dear Sir,

RESEARCH ON ACCOUNTING INFORMATION SYSTEM PRACTICES IN MALAYSIAN PUBLIC SECTOR

Revolution of technology and convergence in accounting standards has significantly affects the accounting practices in all sectors including public sector. The importance role of Accounting Information System (AIS) in supporting the decision making process is widely acknowledged regardless of any type of organisation. However, most organisations are still struggling to achieve the effectiveness of their AIS.

This exploratory research aims to discover the relevant critical success factors of AIS effectiveness and knowledge that required for the AIS application in Malaysian public sector practices. We would therefore seek for your cooperation to participate in a face-to-face interview. This interview intends to obtain your opinion on several matters related to AIS effectiveness. Information gathered from the interview will be kept strictly confidential and the name of the organisation or individual will not be disclosed in any part of our research report.

The expected duration of this interview is approximately 45 minutes. The agenda of discussion will be provided two (2) weeks before the interview. I believe this interview session can in itself be of benefit to you, in that it gives you an opportunity to highlight your opinion towards the improvement of AIS in your organisation as well as Malaysia practices. One of us will be available in Malaysia for the interview from 3rd till 14th August 2015. Thus, it would be great if you can set an appointment within the given period. We do hope you will be willing to be interviewed. Please find the attached consent form to be completed.

Thank you.

Yours sincerely,

(SHARINAH PUASA)
Accounting and Finance Department
University of Strathclyde, UK

(DR. JULIA A. SMITH)
Accounting and Finance Department
University of Strathclyde, UK

CONSENT FORM

With reference to the consent letter dated on 18th June 2015 and titled as RESEARCH ON ACCOUNTING INFORMATION SYSTEM PRACTICES IN MALAYSIAN PUBLIC SECTOR,

- I understand that my participation is voluntary.
- I consent to being audio or video recorded for the purpose of this interview session.
- I understand that any information recorded will remain confidential and no information that identifies me or the organisation, in which I am currently working with, will be made publicly available.
- I understand that anonymised data (i.e. data which do not identify me and the organisation, in which I am currently working with) cannot be withdrawn once they have been included in the study.

☑ I hereby **agree** to participate and be interviewed for the purpose of this study.

Interview date and time: 12 August, 2015 - 10am.

Venue: Chief Accountant's Office.

☐ I hereby **disagree** to participate and be interviewed for the purpose of this study.

Name of organisation: **Ministry of Agriculture and Agro-Based Industry**

Name of participant: ZAHARIN BIN OTHMAN

Signature of participant:

Date: 3rd. August 2015.

ZAHARIN BIN OTHMAN C.A.(M)
Ketua Akauntan
Kementerian Pertanian dan
Industri Asas Tani Malaysia

Appendix G: Results of the Measurement Model – Cronbach's Alpha, Composite Reliability and AVE

Variable/Dimension	Cronbach's Alpha	Composite Reliability	Average Variance Extracted (AVE)
System Quality	0.776	0.869	0.689
Information Quality	0.803	0.882	0.714
Benefit/Usefulness	0.821	0.881	0.651
User Commitment	0.917	0.948	0.858
Technology Support Function	0.936	0.959	0.887
Knowledge	0.894	0.934	0.825
Top Management Support	0.908	0.943	0.846
Culture	0.952	0.969	0.912
Internal Expert	0.955	0.967	0.882
External Expert	0.952	0.969	0.913
Monitoring and Review	0.935	0.951	0.794

Appendix H: Outer Loadings

Item/Variable	System Quality	Information Quality	Benefit/ Usefulness	User Commitment	Technology Support Function	Knowledge	Top Management Support	Culture	Internal Expert	External Expert	Monitoring and Review
AESQ1	0.814	0.565	0.583	0.292	0.295	0.261	0.315	0.309	0.236	0.258	0.237
AESQ2	0.853	0.539	0.500	0.374	0.366	0.303	0.376	0.335	0.263	0.309	0.285
AESQ3	0.823	0.494	0.604	0.291	0.299	0.280	0.313	0.316	0.282	0.272	0.327
AEIQ1	0.501	0.852	0.543	0.343	0.330	0.285	0.362	0.315	0.301	0.308	0.303
AEIQ2	0.543	0.855	0.562	0.253	0.295	0.235	0.335	0.312	0.248	0.282	0.268
AEIQ3	0.574	0.828	0.638	0.373	0.407	0.341	0.417	0.337	0.213	0.280	0.343
AEBU1	0.599	0.563	0.835	0.292	0.318	0.268	0.323	0.339	0.234	0.269	0.317
AEBU2	0.608	0.661	0.874	0.348	0.331	0.283	0.368	0.349	0.250	0.270	0.356
AEBU3	0.441	0.540	0.790	0.256	0.256	0.222	0.264	0.294	0.203	0.210	0.240
AEBU4	0.491	0.469	0.720	0.343	0.396	0.262	0.364	0.402	0.279	0.295	0.407
UC1	0.358	0.352	0.355	0.911	0.639	0.719	0.693	0.636	0.673	0.642	0.622
UC2	0.376	0.362	0.380	0.934	0.639	0.771	0.720	0.641	0.673	0.646	0.631
UC3	0.346	0.372	0.353	0.934	0.604	0.765	0.709	0.636	0.666	0.645	0.609
TSF1	0.345	0.362	0.367	0.656	0.925	0.604	0.764	0.768	0.683	0.681	0.786
TSF2	0.400	0.402	0.404	0.647	0.957	0.610	0.778	0.781	0.664	0.684	0.777
TSF3	0.354	0.409	0.396	0.610	0.943	0.562	0.735	0.758	0.638	0.648	0.774
KN2	0.276	0.308	0.317	0.676	0.541	0.895	0.559	0.520	0.566	0.530	0.493
KN3	0.310	0.321	0.293	0.733	0.557	0.930	0.615	0.570	0.617	0.581	0.544
KN4	0.336	0.317	0.279	0.793	0.610	0.899	0.692	0.617	0.656	0.645	0.591

Continue…

…continue

Item/Variable	System Quality	Information Quality	Benefit/ Usefulness	User Commitment	Technology Support Function	Knowledge	Top Management Support	Culture	Internal Expert	External Expert	Monitoring and Review
TM1	0.378	0.390	0.377	0.611	0.759	0.582	0.846	0.754	0.654	0.672	0.716
TM2	0.384	0.421	0.390	0.749	0.737	0.657	0.955	0.755	0.680	0.690	0.737
TM3	0.364	0.419	0.388	0.737	0.739	0.659	0.955	0.742	0.687	0.680	0.715
CUL1	0.386	0.363	0.423	0.661	0.768	0.606	0.764	0.963	0.712	0.631	0.813
CUL2	0.360	0.350	0.389	0.671	0.807	0.617	0.792	0.949	0.643	0.651	0.812
CUL3	0.361	0.384	0.442	0.637	0.763	0.578	0.773	0.952	0.713	0.633	0.810
INE1	0.309	0.275	0.278	0.673	0.642	0.634	0.691	0.660	0.941	0.697	0.633
INE2	0.293	0.253	0.260	0.646	0.621	0.603	0.657	0.655	0.933	0.697	0.595
INE3	0.30	0.301	0.302	0.683	0.675	0.664	0.686	0.699	0.951	0.710	0.681
INE4	0.274	0.291	0.304	0.712	0.695	0.641	0.708	0.693	0.932	0.733	0.700
EXE1	0.312	0.317	0.30	0.672	0.698	0.651	0.716	0.648	0.734	0.951	0.673
EXE2	0.336	0.326	0.316	0.672	0.664	0.615	0.701	0.645	0.736	0.960	0.647
EXE3	0.324	0.342	0.332	0.649	0.679	0.591	0.699	0.624	0.696	0.955	0.656
MR1	0.317	0.333	0.398	0.558	0.737	0.500	0.700	0.748	0.566	0.648	0.894
MR2	0.314	0.322	0.380	0.547	0.723	0.508	0.682	0.718	0.560	0.642	0.878
MR3	0.280	0.327	0.332	0.638	0.740	0.565	0.679	0.768	0.686	0.582	0.859
MR4	0.288	0.314	0.366	0.596	0.720	0.532	0.692	0.768	0.669	0.582	0.902
MR5	0.317	0.334	0.400	0.642	0.763	0.566	0.735	0.785	0.621	0.618	0.920

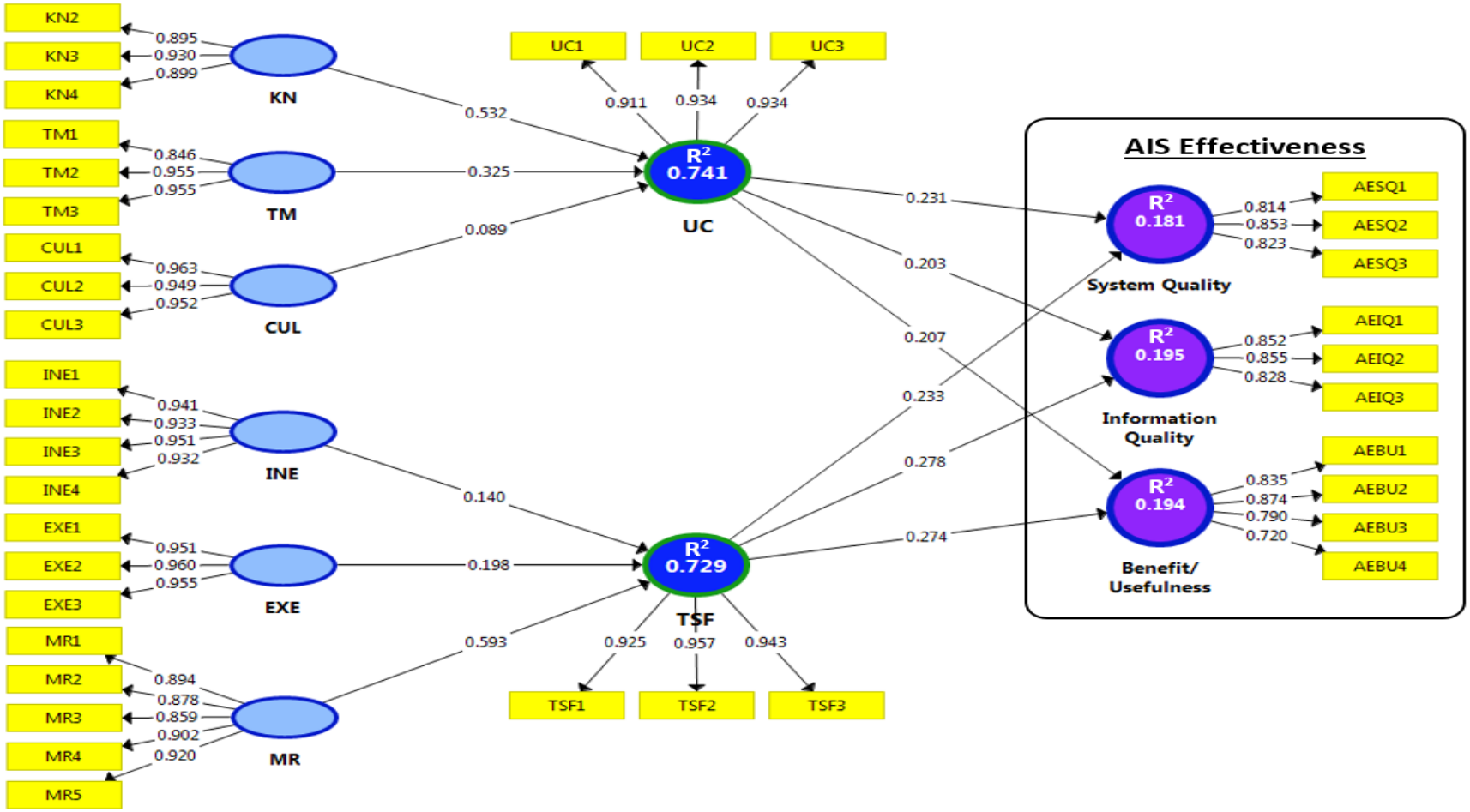
Appendix I: Fornell-Larcker Criterion

Variable/ Dimension	Benefit/ Usefulness	Culture	External Expert	Information Quality	Internal Expert	Knowledge	Monitoring and Review	System Quality	Technology Support Function	Top Management Support	User Commitment
Benefit/Usefulness	0.807										
Culture	0.437	0.955									
External Expert	0.330	0.669	0.956								
Information Quality	0.694	0.383	0.344	0.845							
Internal Expert	0.305	0.722	0.756	0.299	0.939						
Knowledge	0.325	0.629	0.648	0.348	0.678	0.908					
Monitoring and Review	0.421	0.850	0.690	0.366	0.697	0.600	0.891				
System Quality	0.670	0.387	0.339	0.641	0.313	0.340	0.341	0.830			
Technology Support Function	0.413	0.817	0.712	0.415	0.702	0.629	0.827	0.389	0.942		
Top Management Support	0.418	0.813	0.738	0.446	0.731	0.689	0.783	0.407	0.806	0.920	
User Commitment	0.392	0.688	0.696	0.391	0.724	0.812	0.670	0.389	0.677	0.764	0.927

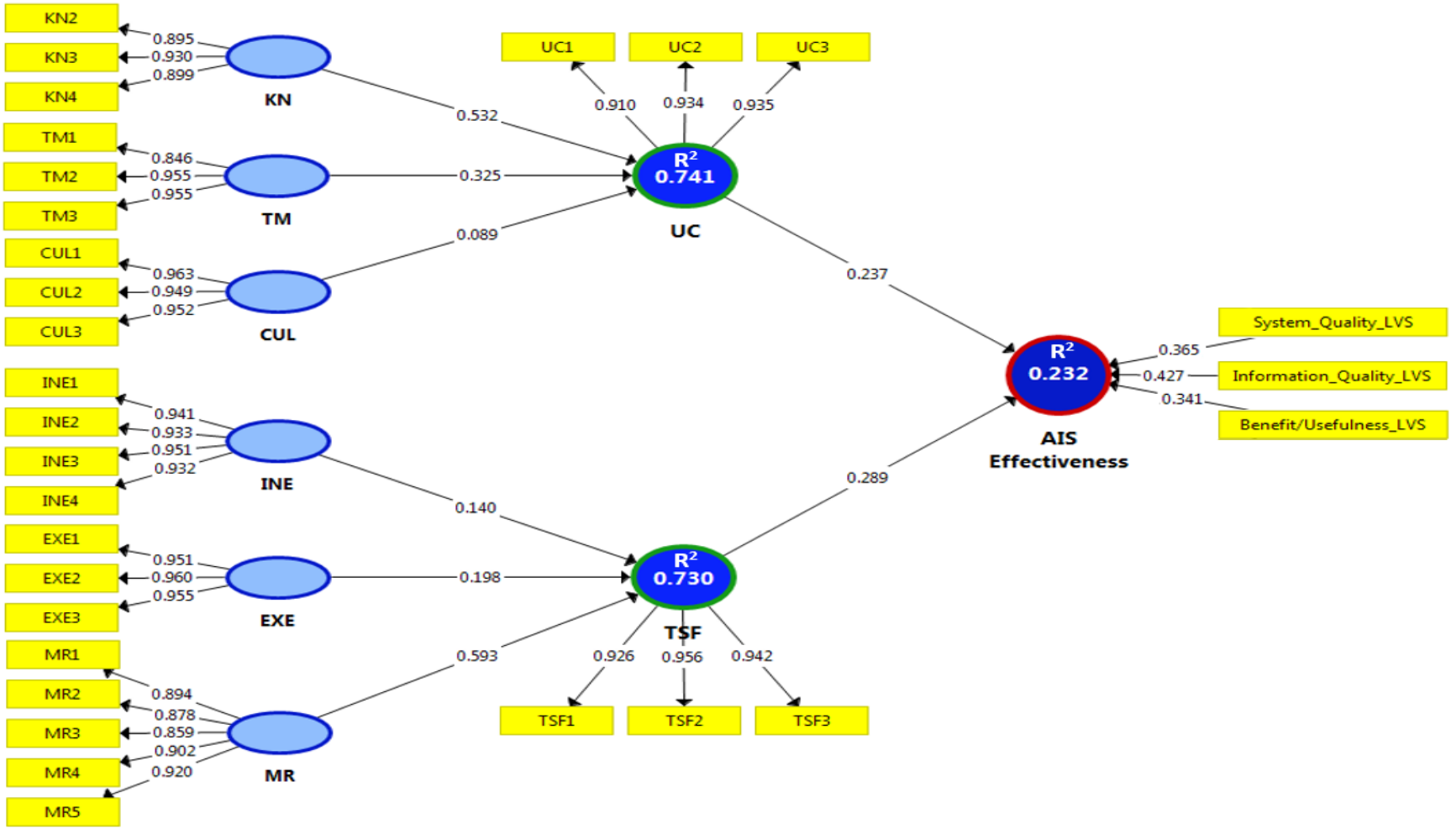
Appendix J: HTMT Values

Variable/Dimension	Benefit/ Usefulness	Culture	External Expert	Information Quality	Internal Expert	Knowledge	Monitoring and Review	System Quality	Technology Support Function	Top Management Support
Benefit/Usefulness										
Culture	0.486									
External Expert	0.366	0.702								
Information Quality	0.844	0.434	0.392							
Internal Expert	0.337	0.757	0.792	0.342						
Knowledge	0.376	0.678	0.698	0.400	0.729					
Monitoring and Review	0.467	0.901	0.730	0.415	0.735	0.653				
System Quality	0.839	0.449	0.391	0.807	0.364	0.404	0.400			
Technology Support Function	0.460	0.865	0.754	0.468	0.742	0.685	0.884	0.452		
Top Management Support	0.475	0.878	0.797	0.514	0.786	0.760	0.853	0.482	0.879	
User Commitment	0.442	0.736	0.744	0.444	0.772	0.892	0.723	0.455	0.731	0.834

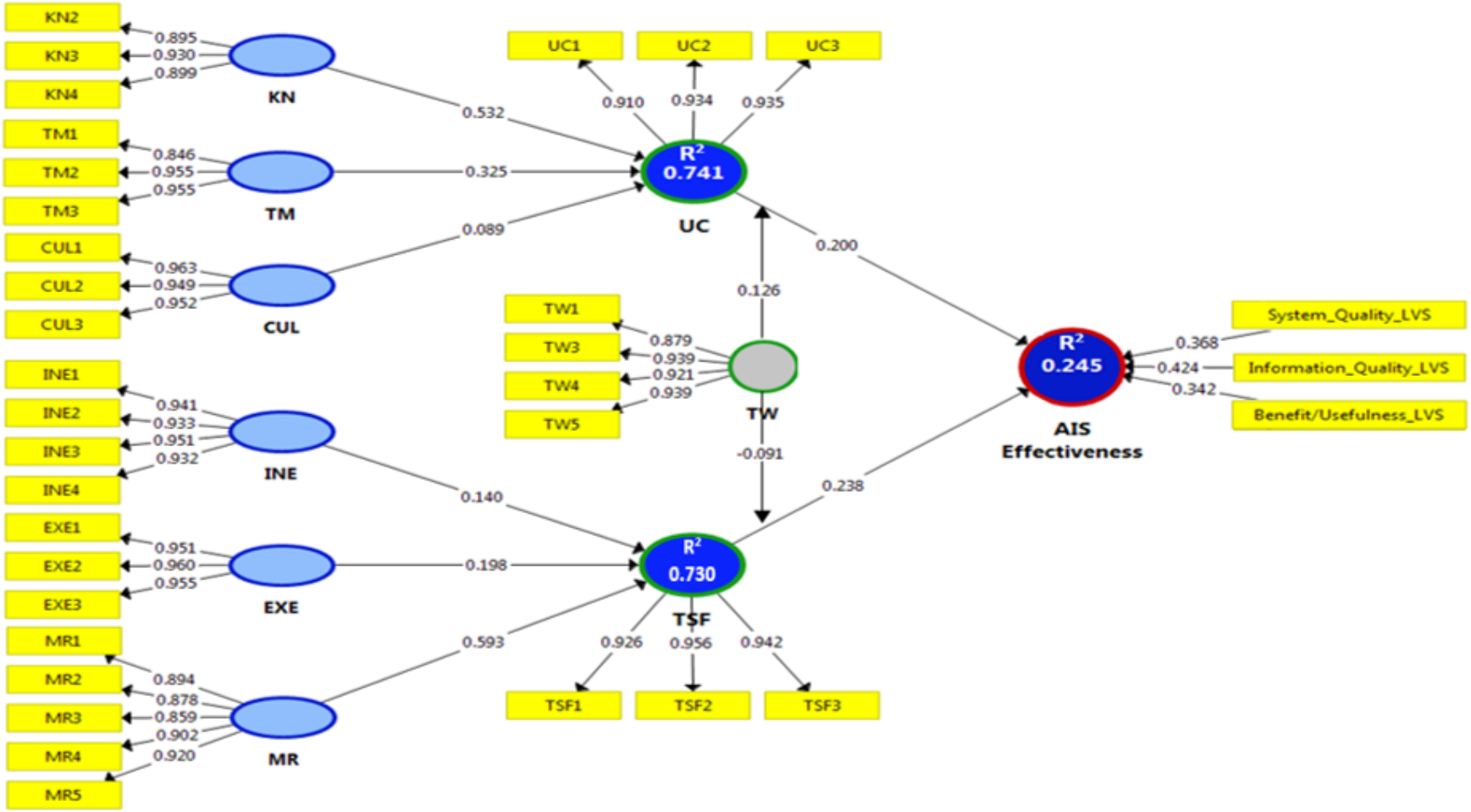
Appendix K: Main Research Model (PLS Algorithm – Path coefficient values)



Appendix L: Final Model Applying HCM Second-Stage Analysis (PLS Algorithm – Path coefficient values)



Appendix M: Final Model Applying HCM Second-Stage Analysis with a Moderator (PLS Algorithm – Path coefficient values)



Appendix N: VIF Values of Each Subpart in the Research Model

Variable	System Quality	Information Quality	Benefit/ Usefulness	AIS Effectiveness	User Commitment	Technology Support Function
User Commitment	1.846	1.846	1.846	2.245		
Technology Support Function	1.846	1.846	1.846	2.869		
Teamwork				3.227		
Moderator (User Commitment * AIS Effectiveness)				1.800		
Moderator (Technology Support Function * AIS Effectiveness)				1.822		
Knowledge					1.955	
Top Management Support					3.484	
Culture					3.030	
Internal Expert						2.703
External Expert						2.653
Monitoring and Review						2.208